BATS IN YOUR ATTIC?

FALL/WINTER/1998

ROTUNDA

the magazine of the Royal Ontario Museum

THE EMOTIONAL ROLLER-COASTER OF RESEARCH IN VIETNAM

A TAINO HOUSE RISES FROM THE DEEP

A NEW SEARCH FOR THE MISSING HUMAN LINK

A RARE CHINESE CARRIAGE

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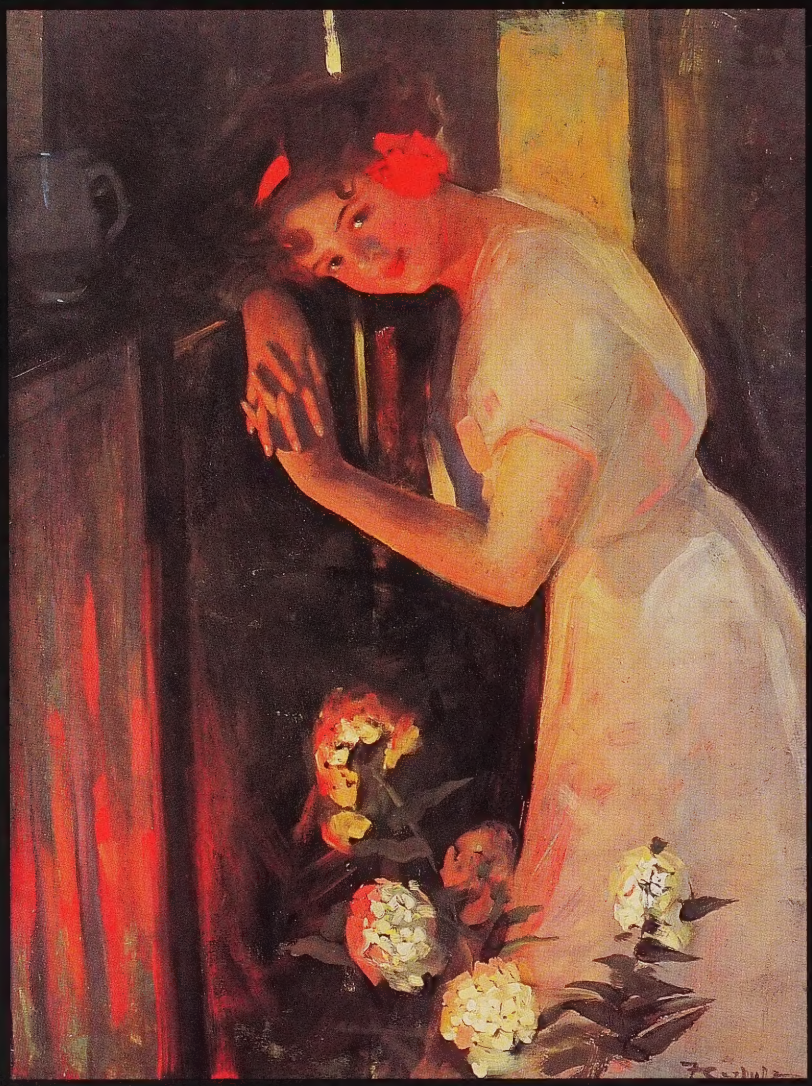

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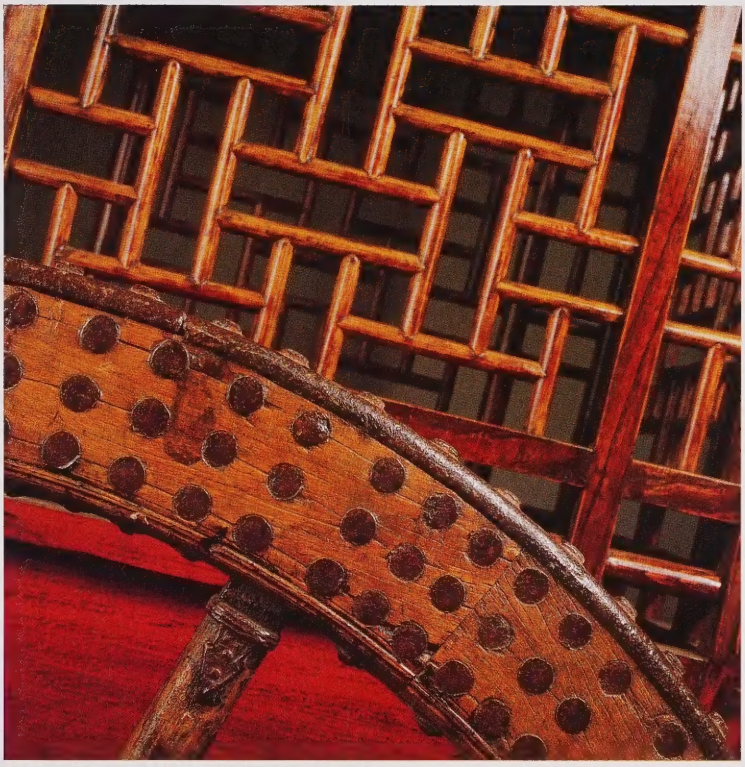

COVER
A woman dressed in the everyday clothing of the Dao minority, who live in Vietnam near the Chinese border. ROM researchers find that work in Vietnam is a rollercoaster ride of emotional highs and lows. To learn why turn to page 18.
PHOTOGRAPH BY AMY LATHROP

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ROTUNDA STAFF
Sandra Shaul, *Executive Editor*
Peter Enneson Design Inc., *Design and Production*
Jennifer Little, *Administrative Assistant*

ADVERTISING SALES
Shaenie Colterjohn-Guy, Leo Media
159 Welland Avenue, Toronto, Ontario M4T 2J6
(416) 483-0473

EDITORIAL AND MARKETING OFFICES
Rotunda, the magazine of the Royal Ontario Museum, 100 Queen's Park,
Toronto, Ontario, M5S 2C6, or telephone (416) 586-5585, fax (416)586-5887
e-mail lee-anne@rom.on.ca • ROM web site: www.rom.on.ca
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Editor's Note

Test your image of Vietnam against the portrait of the Dao woman on the cover. She is part of an ethnic minority living near the Chinese border. ROM researchers working in remote regions of this small country experience an almost daily mixture of euphoria, from discovering previously unknown animal species, and despair, from witnessing the human condition and vast devastation of the environment. Working in Vietnam is an emotional rollercoaster ride, as Robert Murphy explains in the cover story. Murphy, a curator in the Museum's Centre for Biodiversity and Conservation Biology, leads the ROM's research in Vietnam. Travelling by plane, truck, boat, and even elephant, Murphy and his crew have encountered a level of biodiversity and variety of human cultures beyond all expectations.

So much of the ROM's research is now taking place in the Third World as Western expertise is enthusiastically applied to the exploration of areas previously inaccessible because of war and politics. Robert Walter, a geologist and senior scientist with the Department of Earth Sciences, is leading work in Eritrea to find the missing link between the earliest known hominids and *homo sapiens.* Based on the theory that humans evolved in and then migrated out of Africa, there are two logical routes that could have been followed: along the ancient Nile River and along the Red Sea coast. Consequently, fossil remains should be found in these locations. Whereas most research has taken place along the Nile, Walter explains in this article why he is searching along the Red Sea.

And about a year ago, in a story somewhat closer to home, David Pendergast, vice-president for Collections and Research, wrote about his discovery of an unusually well-preserved and large Taino site at Los Buchillones in Cuba. Since then he has gained worldwide attention with the discovery, at the site, of an astoundingly well-preserved Taino house. In this issue, Pendergast describes the excitement of this latest and most unusual find, and explains its importance.

People tend not to value things unless they are rare. How many one-dollar bills did you save just before the loonie was introduced? For about 700 years and well into the early part of this century, the *jiaoche,* the two-wheeled Chinese carriage, was a most common sight. Replaced by the car and other motorized vehicles, fewer than a dozen such carriages are now preserved in China, and only one outside China. Thanks to the foresight and generosity of Joey and Toby Tanenbaum, that one will soon be on view at the Royal Ontario Museum. Klaas Ruitenbeek of the ROM's Department of Near Eastern and Asian Civilizations writes about the uniquely Chinese mechanics of the *jiaoche* and the consistency of its design over the centuries.

For the past thirteen and a half years I have had the great pleasure of sharing with you stories about the adventures of ROM researchers and their colleagues around the world, and about all the wonderful artifacts and specimens in the Museum's collections. With this issue, I conclude my editorship of *Rotunda.* After travelling vicariously, through the experiences of my colleagues, I am taking some time off for adventures of my own.

Maybe I'll meet you on the way.

Sandra Shaul

Sandra Shaul

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Two views of the ROM's exceptional new specimen of catapleiite.

An Exceptional Catapleiite from Mont-Saint-Hilaire, Quebec

PHOTOGRAPHY BY BRIAN BOYLE, ROM

A TRULY EXCEPTIONAL CATAPLEIITE specimen from the Poudrette Quarry, Mont-Saint-Hilaire, Quebec, was recently acquired by the Department of Earth Sciences, Royal Ontario Museum. Its purchase was made possible through funds provided by the Canadian Cultural Property Export Review Board and the Gem, Mineral, and Fossil Fund of the Royal Ontario Museum Foundation. In describing the importance of the specimen, the mineralogist on the Canadian Cultural Property Export Review Board wrote: "Mineral specimens like this are one of a kind; the size and beauty of this catapleiite specimen place it among the top two or three found at Mont-Saint-Hilaire."

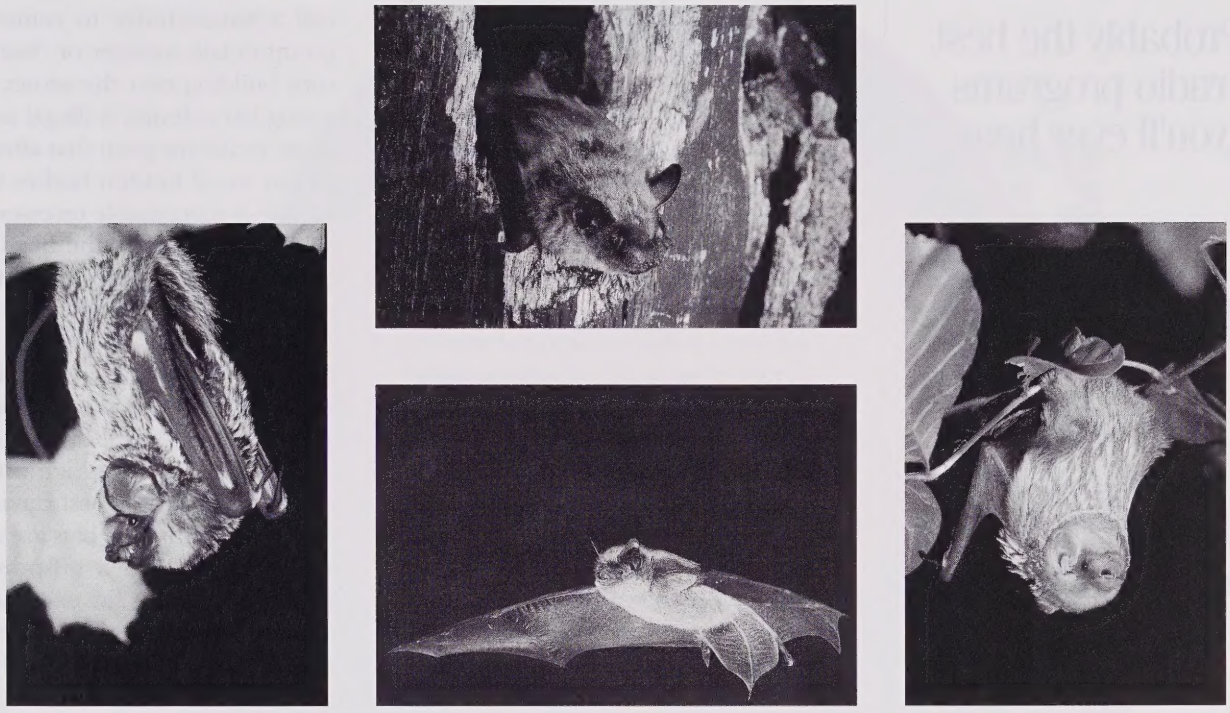
Catapleiite, a sodium zirconium silicate ($Na_2ZrSi_3O•2H_2O$), is normally found in small crystals, rarely larger than 2 cm in diameter. There are only a few known localities worldwide. This beautiful specimen was collected from Mont-Saint-Hilaire in the summer of 1991. It is one of three large specimens found in a cavity that also produced a number of smaller examples. Measuring 9 cm in diameter, the ROM's specimen has lustrous, well-formed, thin flat hexagon-shaped crystals that are stacked into a rosette. Mineralogists say that catapleiite is pseu-

do-hexagonal because the hexagonal outline of the crystals is misleading. In fact, the mineral actually crystallizes in the monoclinic crystal system, which refers to the arrangement of the atoms that make up the mineral. Impressive in its appearance, the specimen is pierced through by black, prismatic crystals of aegerine and sprinkled with tiny crystals of dolomite coated with calcite. At the centre the catapleiite crystals are translucent because of the dolomite and aegerine, but near their edges the crystals become transparent, often showing beautiful plays of colour caused by optical dispersion.

Mont-Saint-Hilaire, located 25 kilometres east of Montreal, is one of the Monteregian Hills. The hills may be remnants of volcanoes that were formed approximately 125 million years ago. There were a number of different pulses of magma that reacted with sedimentary rocks creating the wonderful diversity of minerals that are found today. The Poudrette Quarry on Mont-Saint-Hilaire has been an important mineral locality for more than 30 years, although the first finds of unusual minerals were reported in the late 1890s. The quarry was opened in 1959 as a source of crushed stone. This made the mountain accessible for collecting, and over 300 different mineral species have been reported to date, including 31 species new to science. The work continues today as more than 40 undescribed species continue to be studied at different institutions, including the Royal Ontario Museum.

The size, the perfection of the crystals, and the overall aesthetics of the piece, combine to make the ROM's new specimen a rare and valuable find, and a wonderful addition to the mineral collection. Look for the catapleiite specimen in its new home in the Inco Gallery of Earth Sciences, opening in May 1999.

MALCOLM BACK
Malcolm Back is the X-ray technician in the Department of Earth Sciences, Royal Ontario Museum



Four species of bats commonly seen near homes or cottages in Ontario are (clockwise from top) big brown bat, red bat, little brown bat, and hoary bat.

Bats in the Attic

WHAT IS THAT FLUTTERING BEhind the curtains? How did a bird get into the house? Yikes! That's no bird, it's a bat! From May to September, calls from the general public to my office are mostly about bats discovered in homes and cottages. The frequency of the calls peaks in fall and spring when many bats seem to resettle, suddenly appearing on the outside of a house or a tree, or occasionally inside a building. The most common questions are why do bats appear in certain seasons, should people be concerned when a bat is found, and how does one go about ridding a home or cottage of such unwanted guests?

To begin, I should explain a little about Ontario bats—where they live and why they resettle at certain times of the year. Nine species of bats are known to occur in Ontario, four of which are commonly seen near homes or cottages (big brown bat, *Eptesicus fuscus*; little brown bat, *Myotis lucifugus*; red bat, *Lasiurus borealis*; and hoary bat, *Lasiurus cinereus*). All bats found in Ontario are relatively small (compared to some tropical species) and all feed on insects captured in flight.

Ontario bats live in a variety of places; some roost in the foliage and small branches of trees (hoary and red bats) and some are cavity, crevice, or cave dwellers (big brown and little brown bats). It is the latter selection of habitats that often brings bats in close proximity to people. Every year, with great enthusiasm and proficiency, we build large numbers of buildings, artificial caves that abound with potential roosting sites. In summer in cottage country, little brown bats are commonly found roosting in attics, under eaves, under siding, and in other hiding places large and small. Big brown bats are, however, our most common co-habitants in cities. Ontario bats occupy their summer roosts from March or April through to September or October.

During summer, female little brown and big brown bats form maternity colonies comprising mothers and their young born that year. Males are less social and form small bachelor groups elsewhere or roost alone. It is the maternity colonies that prompt the greatest volume of summer calls to my office. Not surprisingly, little brown and big brown bats are the species most often discovered inside the living areas of homes or cottages (like the one caught behind the curtain). Often, these bats already have a roost in the building or a nearby one, and accidentally enter or become trapped in an unfamiliar part of the structure.

The foliage-roosting species are much less gregarious, never forming large colonies. In late summer, female red bats, which give birth to

PHOTOGRAPHY BY BROCK FENTON

two to four young per year (most temperate bats have only one), carry the older juveniles when feeding and occasionally are found, too weighed-down to regain flight, on the ground or a tree.

Where do bats go in winter? Big brown and little brown bats hibernate over the winter, a season in which they are unable to catch insects. These bats have different roosting requirements in winter than in summer. In summer, females need high temperatures in a protected environment to raise their young, whereas in winter hibernating bats need a site with cool temperatures, just above freezing, with relatively high humidity. Usually buildings are too dry and warm for successful hibernation, and in the fall both male and female big brown and little brown bats move to more humid caves where they spend the winter. (Occasionally big brown bats will hibernate in buildings.)

The tree-roosting hoary and red bats are both migratory, leaving in September and October for more southerly climes where they, and the insects they hunt, remain active all winter. During spring and fall movements, both hibernating and migratory species can appear on the outside of buildings and trees.

What should you do if you find a bat in or near your house, or if you find that you have a summer colony in your building? Like other mammals, bats can carry rabies, although rabies actually is more common in some carnivores such as foxes and skunks. Infected bats typically exhibit visible signs of the disease (although they are not aggressive) and sick individuals are much more likely to be found in unusual situations such as on open ground during the day. If you encounter such an individual, you should avoid handling it, as bats like most mammals will bite in self-defence and could transmit the rabies virus. If it is outside, the bat should be left alone; most likely it will be gone the next day. If the bat is inside, the best course is to call the Humane Society.

In some parts of North America histoplasmosis, a fungal disease, is associated with bat droppings (guano). If you have a colony in your attic, and the colony is unwelcome, you should call a bat-excluder to remove the group in late summer or "bat-proof" your building over the winter. Fumigating bat colonies is illegal and can cause problems given that after fumigation small hidden bodies will be rotting in inaccessible recesses of the dwelling. Moreover, the health risks of living with residual fumigant usually outweigh any potential risks associated with the bats themselves. A professional excluder will determine the entries and exits of the bats, and will allow them to fly out but not return by blocking their passage with netting. This process is best carried out in the fall so that the bats are able to successfully rear their offspring during the summer. An excluder will then permanently seal any active or potential openings to the former roost. Following exclusion, accumulations of guano should be cleared away. While cleaning, use a mask equipped with a charcoal filter that removes particles larger than 10 microns (the size of the fungal spores) to minimize the risk of exposure to histoplasmosis.

As the only mammals that fly, bats have fired the popular imagination and for many people retain a mysterious aura, generating both highly positive and highly negative reactions. They are among the most beneficial mammals because they consume enormous quantities of insects, particularly during the energy-demanding process of rearing young. If a colony is excluded from a building or if you would like to have a group near your home or cottage, bat houses can be erected as an alternative roost. In the next issue of *Rotunda* I will discuss bat houses and give some designs for attracting these fascinating mammals. The bats will not only be the talk of the neighbourhood, they will also consume loads of unwanted insects.

MARK ENGSTROM
Mark Engstrom is a curator in the Centre for Biodiversity and Conservation Biology, Royal Ontario Museum

Lentils come in a variety of colours and sizes. The New Kingdom terra cotta serving dish from the Egyptian collection of the Royal Ontario Museum may once have held red lentils, a common food in ancient Egypt.

Lentils

DOCTORS ARE INSTRUCTING YOU TO eat lentils to save your life. The humble lentil, for most North Americans an oddity marinated in obscurity, is a hand-grenade of healthy properties. It fairly bursts with protein, carbohydrates, phosphorus, iron, and vitamin B—designed to have you linger longer before moving on to your next incarnation.

But lentils, the great sustainer of India's masses, are more than the diet doctors' miracle bean of the week. They are high fashion on cutting-edge menus. In Provence, it is almost impossible to find a roast duck without green lentils. At Nuances, the highly acclaimed restaurant in Le Casino de Montreal, silken *foie gras* arrives sided with smoked lentils, the supreme appointment. In this neck of the woods, peasant chic prevails. Chefs dish out all varieties—green, red, black, yellow—to diners who only last year couldn't tell lentils from lintels.

This is fine by me. I come from a long line of peasants and we're always right. Lentils are the essence of gastronomic antiquity. Humanity has cultivated the lentil for approximately 9000 years, rendering it the grandaddy of legumes. The lentil may have originated from northern Iraq, where carbon dating takes it back to 6750 BC. India claims it as its own, but can't prove it. History's ancients—the Babylonians, Egyptians, Greeks—wholeheartedly endorsed lentils. A lentil purée has been found in an almost 4000-year-old tomb at Thebes, a little something for the afterlife.

Durable, cheap, and versatile, lentils journeyed well, arriving in Germany in the Neolithic era. Greek philosophers consumed them to show they were above worldly pleasures, while the general population wolfed them down. Hippocrates recommended them for liver ailments, to be accompanied by slices of boiled dog. At the same time, he shunned them as "rough, creating gluey blood which stops up the liver, creates melancholia, fourth-day shivers, and heavy dreams, and dulls the vision and the strength of the brain."

The Romans were more voracious and sophisticated. Non-stop ships from Alexandria transported Egyptian red lentils to the port of Ostia. The obelisk that now stands in front of St. Peter's arrived padded with tonnes of them. The Romans served them with chestnuts and mussels, and a prominent family took its name, Lentulus, from the sturdy legume.

PHOTOGRAPH BY BRIAN BOYLE

Lentils turned up in the Bible as the stuff Ezekiel was obliged to eat as a penance, although it was popular enough among his brethren. In the Middle Ages, Europeans got it all wrong and condemned lentils for inflaming the stomach, weakening eyesight, and prompting nightmares. Trappist monks exhibited their asceticism and misery by gorging on lentils. "The worst of all vegetables," snarled Platina the Italian.

By the time of Louis XIV, the French had come around and soon the tiny green lentils grown in France were in high fashion. In 1806, Viard's *National Cook* came up with the landmark recipe for duck and lentil purée. But the lentil has never caught on with snobs. "It is called vulgar," wrote Robert Courtine, food editor of *Le Monde*. "It brings with it a whiff of boarding school and the barracks, not to say the prison....Nevertheless, the true gourmet revels in it...at every moment of the meal, from lentil soup to lentil salad." Taste a Provençal salad of green olives and lentils and you will jump up out of your chair and applaud the man.

Americans have traditionally run away from lentils, probably because of their reputation, as with other legumes such as fava beans, for putting the gas in gastronomy and prompting inadvertent displays of levitation. Historically, a number of writers, starting with the Roman Catholic Saint Jerome, had divined in flatulence erotic properties. Herodotus observed that Egyptian priests sworn to celibacy were forbidden even to *look* at beans. This may account for the speed with which Americans, who have never been able to exorcise the Puritan element from their souls, flee the lentil.

All the while, no one adopted and refined lentils on the scale with which they have been embraced in India. Even today, India remains the world's largest and most avid consumer of lentils. In the desert country of Rajasthan, I've eaten with dirt-poor villagers who, with a handful of lentils, rice, and spices, have managed to turn out a meal that would shame anything consumed by the highest-born Englishman. The lentil struts its stuff in a vast range of dishes from *rasam*, the clear Indian soup that may be drunk as a consommé, to the famous *dals* or magically spiced lentil purées which accompany almost every meal, even those summoned up by maharajahs for special occasions.

The excellent *Bombay Brasserie Cookbook* (Raincoast Books, $34.95) by chef Udit Sarkhel salutes the London restaurant operated by India's elite Taj Group of hotels. It numbers among its customers a Who's Who of British celebrity. Sarkhel has delighted them with lentil recipes, including tomato-and-lentil soup, fried dumplings, mixed vegetables, lemon rice, spicy lamb curry, and the festive *cholar dal* with coconut and raisins, a favourite dish at Bengali weddings.

In Canadian cities, Indian markets display heaping bins of green, brown, black, and red lentils. Interestingly, it is the tiny green French variety, the *Puy* lentil, which holds its shape best, that is most prized. *Masoor dal* or peeled red lentils, known as Egyptian lentils in the Middle East, turn yellow during cooking and most commonly provide the base for everyday dals. Chinese or brown lentils turn to mush on the stove.

Mother India's kitchen, however, has no monopoly on lentils. The great peasant staple spans the globe. Italians regard them as good-luck fare and serve them with pork sausages and pig trotters—pork and beans with gusto—especially at New Year's in Rome. A thick lentil stew seasoned with coriander, garlic, and onion ranks as a gastronomic high in the mountains of Yemen. Moroccans turn out a lentil salad spiked with coriander, garlic, oregano, and cumin. At Roscoff, the premier restaurant in Belfast, Canadian Jeanne Rankin celebrates Irish produce with a salad of smoked pheasant, creamed lentils, and roast garlic. If we eat lentils to stay healthy, healthiness keeps us fit to eat more lentils.

My wife, Carol Clemens, and I enjoy the following dish at home.

DAL MAKHANI
(BUTTERED BLACK LENTILS)

This is the classically rich and celebratory Indian dal. The creamy, moderately spicy lentils can be served as an accompaniment to roast or grilled fishes, fowl, meats, or even game.

Ingredients

- 250 ml (1 cup) whole black lentils (urad dal)
- 60 ml (1/4 cup) dried whole red kidney beans
- 8 green cardamom pods, lightly crushed
- 2 whole cloves
- 5 ml (1 tsp) coriander seeds, lightly crushed
- 250 ml (1 cup) finely diced onion
- 2 cloves garlic, minced
- 15 ml (1 tbsp) vegetable oil
- 15 ml (1 tbsp) fresh grated ginger
- 250 ml (1 cup) diced tomatoes
- 5 ml (1 tsp) cumin seeds
- 125 ml (½ cup) butter
- 1 hot green chili, finely chopped (or to taste)
- 30-45 ml (2–3 tbsp) cream
- 125 ml (½ cup) finely chopped fresh coriander
- salt to taste

Preparation

Pick over lentils to remove grit and other foreign bits.

Place lentils and beans in a large pot and cover with 5 cm (2 inches) of water. Bring to a rapid boil then reduce heat to medium and boil 10 minutes. Drain immediately and rinse well with cold water. Return beans to pot, cover with fresh cold water, and set aside to soak at least one hour. Drain and rinse.

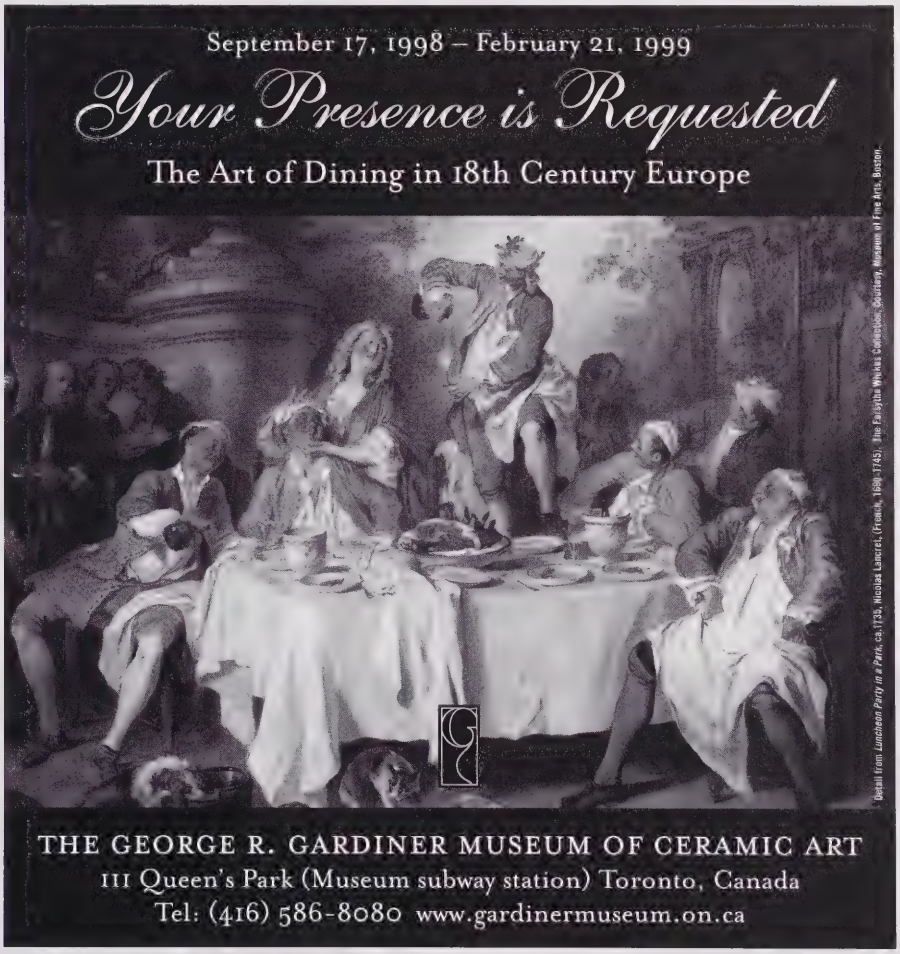
Place the cardamom pods, cloves, and coriander seeds in a square of muslin or cheesecloth and tie securely as you would a bouquet garni.

Sauté onion and garlic in oil until soft and light golden brown. Combine lentils, beans, onion, garlic, ginger, tomatoes, and spice bag in a large pot. Cover with 10 cm (four inches) of cold water. Bring to the boil and then reduce to simmer. Stir every 15 minutes. Add water if mixture becomes too dry. The mixture should simmer uncovered for about three hours, until all beans and lentils are soft. Remove spice bag. Mash about one third of the beans gently with the back of a wooden spoon. The final mixture should be very moist but not runny. Set aside.

In a small fry pan heat the butter over high until it just begins to colour. Add the cumin seeds and sauté, stirring constantly for 10 seconds. Remove from heat and stir in the green chili. Immediately pour butter mixture into bean mixture. Add cream and half of the coriander leaves. Stir well to combine. Simmer an additional 5 minutes, adjust salt, top with remaining coriander and serve.

Serves 6 as a side dish

JEREMY FERGUSON
Jeremy Ferguson writes about food and travel



A Two-Wheeled Legacy

A rare Chinese carriage is a "living document" about travel before the automobile

Klaas Ruitenbeek

PHOTOGRAPHY BY BRIAN BOYLE

According to police statistics for March 1919, the roads of Beijing, a city of 800,000 inhabitants, were travelled by 519 automobiles; 2222 Western-style, four-wheeled carriages; 4198 Chinese-style, two-wheeled carriages; and 17,815 rickshaws. (By comparison, present-day Toronto, with a population of 2,100,000, accommodates 1,240,000 motorized vehicles and an unknown but considerable number of bicycles.)

Back around 1860, there were virtually no Western-style carriages (or Westerners) in China. Rickshaws were not introduced from Japan until 1874. Before rickshaws, people who could afford them used sedan chairs for short distances. For longer distances, they would use the two-wheeled carriage called a *jiaoche,* literally a sedan-carriage.

Old photographs show that in spite of the limited number of vehicles, traffic in

Beijing was as chaotic in the past as it is today. They also show what the *jiaoche* looked like. In fact, until very recently, photographs were almost the only way to see this type of carriage. No one in the West and very few people in China had ever seen one "in the flesh." Although once a common sight throughout Beijing and northern China, *jiaoches* disappeared after the 1930s. Then, by a stroke of good luck, Joey and Toby Tanenbaum, well-known art collectors from Toronto, had a chance to acquire one.

Realizing the rarity of the object and its great potential as a museum exhibit, they recently decided to present it to the Royal Ontario Museum as a long-term loan and intended gift. The beautifully crafted, lacquered wooden carriage, with its heavy brass fittings and large, nail-studded wheels, dates from the early 19th century. In China, fewer than a dozen such vehicles have been preserved, and outside China the ROM is the only place in the world that has one.

The careful workmanship, the elegant lattice, the heavy brass fittings, and the black-and-red lacquering show that the ROM's carriage was a luxury vehicle, but its construction is exactly the same as that of the simpler examples in the old photographs. It is also remarkable that the same type of vehicle was found all over northern China, with very little variation, from Gansu province in the west to Manchuria in the northeast, a distance of 2500 km.

South of the Yangzi River, on the other hand, these carriages were rarely used. In contrast to the arid north, the plains in the south were intersected by watercourses, so boat traffic was more convenient there. And on the narrow paths in the hills people used large wheelbarrows, not just for goods but also for transporting people.

Although once a common means of transportation, Chinese carriages are far from ordinary in their appearance. They are objects of beautiful and highly functional design, as was Ferdinand Porsche's original Volkswagen Beetle of 1936. Composed of only the most basic geometrical forms, the carriage shafts and body comprise straight lines and rectangu-

Build Your Own Jiaoche

The *jiaoche* at the ROM is both simple and elegant in its construction. Two 355-cm-long shafts are connected by cross-bars at the rear and in the middle into a chassis that rests on a 195-cm-long axle beam. A wheel extends from each end of the axle. The axle is held in place by pegs that protrude below the shafts, and can thus be easily removed. Over the shafts, between the wheels, the body of the carriage with its board floor, domed wicker top, and latticed side and rear panels is constructed, 122 cm long, 81 cm wide, and 126 cm high. At the rear, the shafts protrude for 51 cm, connected by three cross-bars, to form a luggage carrier. In front of the covered body, there is a 30-cm-wide driver's seat, and beyond that the shafts, rounded and tapering towards the ends, protrude for another 152 cm to accommodate the draught animal and its harness. Most parts of the carriage are made of elm. However, for the shafts willow is used; for the spokes of the wheels, wood of the pagoda tree *(Sophora japonica)* is used; and for the felloes of the wheels, wood of the Chinese date *(Ziziphus jujuba)* is used.

The large wheels, 124 cm in diameter, are very heavy, each weighing 46 km. They consist of a solid hub, 18 spokes, and a nine-segment felloe with an iron rim. Their construction is different from that of wooden wheels in the Western world. The iron rim, or tire, is not continuous but consists of nine segments, positioned in such a way that their joins alternate with the joins of the wooden felloes. The felloe parts are not pulled together tightly by a continuous iron hoop that has been fitted red-hot and then shrunk in cooling. Instead they are secured by nailing down the iron rim sections. (For more details see *Why Are There So Many Nails in a Chinese Wheel?*)

As for the hub, there are, of course, no ball bearings, but the axle opening is lined on both sides with heavy iron rings that fit over the axle. To prevent the axle from wearing down, longitudinal slots are cut into it at the position of the hub rings, and these are filled up with iron bars. The wheels are prevented from slipping off the axle by wooden linchpins that fit into holes in the axle. The wheels had to be lubricated continuously, and to this end a bamboo or porcelain bottle containing heavy vegetable oil was usually bound to one of the shafts near the driver.

Klaas Ruitenbeek holds the Louise Hawley Stone Chair of Far Eastern Art, Department of Near Eastern and Asian Civilizations, Royal Ontario Museum

lar planes, alternating with circular shapes in the wheels, the domed top, and the brass fittings.

The carriages have narrow iron tires with protruding nailheads, which could cut street paving to pieces. This was not a serious problem, however, because there were few paved roads in China, and broad-tired wheels were ineffective on the unpaved roads outside of the city, especially in the rainy season. Contrary to what one would expect, narrow-tired wheels are better for travelling over muddy roads. Unlike broad tires, they cut through the mud and do not become clogged.

It is remarkable that the same type of vehicle was found all over northern China, with very little variation, from Gansu province in the west to Manchuria in the northeast, a distance of 2500 km

Carriages of this type carried only one passenger, who sat with his or her legs either crossed or stretched straight on a padded quilt spread upon the board floor. (The cart had no springs.) The driver sat out in front on one of the shafts, with his feet dangling down. To get into the cart, the passenger stepped up on a low bench, which when the carriage was in motion was placed between the shafts, providing extra space for the driver. On the underside of the bench belonging to the carriage at the Museum is an inscription that reads "Bench for an official of rank to step into his carriage."

The hood and the latticed panels of the carriage were covered with white or blue cotton cloth, sometimes with an additional covering of oil cloth. An awning extended from the roof of the carriage forward as far as the back of the animal, primarily to protect the driver. It was supported by slanting struts that fit into sockets on the shafts and was stretched taut by ropes.

The harness for the draught animal was similar to an American harness and consisted of a collar, saddle, breeching, and traces. A piece of rope usually formed the girth. The wooden saddle was not meant for riding, but rather bore the vertical weight of the shafts. The saddle belonging to the ROM carriage is beautifully carved.

In the Chinese countryside, you can still see simple carts drawn by donkeys and

A two-wheeled Chinese carriage (preceding pages), called a *jiaoche*, is on long-term loan to the Royal Ontario Museum. Such vehicles, once common, are now so rare that they are better known from tomb sculptures, paintings, and photographs. The ox-cart shown in the top illustration is a detail from *Going up the River for Spring Festival*, a painting by Zhang Zeduan from the 12th century. A carriage from Beijing (middle) and traffic in Beijing were photographed around 1900.

mules. Their harnesses, although very crudely executed, are similar to the one that would have been used for the ROM's luxury vehicle. Toy carriages, once cherished by Chinese boys, show what a fully mounted carriage looked like. George Crofts, the man who helped the ROM to build its Chinese collection at the beginning of this century, once sent a photograph to the Museum showing a number of these toys, which were available for purchase. Unfortunately, they were not bought by the Museum, and their present whereabouts is unknown.

Why Are There So Many Nails in a Chinese Wheel?

One of the main forces a wheel must withstand is horizontal torque, the wrenching and squeezing that occurs when a cart takes a curve. A Chinese wheel does not have a continuous iron hoop tire that binds the felloe, spokes, and hub tightly together. Instead, its tire consists of nine iron strakes nailed onto the outer rim of the wooden felloes.

The wooden mortice-and-tenon joins between the felloes are very short, 10 mm only, and offer little help in withstanding horizontal torque. It is the heavy strakes—12 mm thick and 38 mm wide—that must do the job. Eight of the 10 thick, long iron nails with protruding heads, which are used for fastening each strake, pass right through the entire 10-cm width of the felloe, and are rivetted over an iron washer on its inner edge. The other two are driven into the 10-cm-long, 3.6-cm-wide, and 2-cm-thick tenons of the spokes, which fit into mortices cut into the felloe and are secured by wedges hammered in alongside.

Weakened by so many perforations, there is a considerable risk of splitting the thin felloe. In order to prevent this, the felloe is reinforced by transverse rivets, 33 per felloe part, neatly arranged in three rows of 11. Their flat heads show on the outside of the wheel, while their tails are rivetted over small washers on the inside. Each wheel is thus perforated by 90 long radial nails and 297 shorter transverse ones.

And this is not all. To prevent the spokes from splitting near the tenons at the tongue and foot, they are reinforced by iron rings, which are kept in position by a nail through an ornamental, triangular tag. This adds up to 423 nails per wheel. Perfect snow tires!

The ROM carriage represents the last type of hand-made, wooden vehicle that was widely used before the introduction of automobiles in China. It marks the end of a more than 3000-year history of vehicles designed by Chinese cartwrights.

The first 1000 years of that history relate to the chariot. Mainly used in warfare, the chariot has a central pole, as opposed to the two shafts of later vehicles, and thus must be drawn by at least two animals. It appeared rather suddenly in China around 1200 BC, introduced from Central Asia. In the ancient Near East, chariots had been used as early as the third millennium BC.

The development of the chariot can be reconstructed fairly precisely from the numerous examples that have been found in tombs from the late Shang to the Western Han dynasty, c. 1200–100 BC. Around 250 BC, the carriage with two shafts appears. It is remarkable how closely some of the early examples resemble the ROM carriage built 2000 years later.

Around the time of the introduction of the two-shafted carriage, the practice of burying real carriages in tombs disappeared.

Beginning about 200 BC, wooden or pottery models of servants and implements, including carts, were buried with the dead. And so the development of the carriage can still be followed from these models until at least the 10th century AD, when tomb models became less common.

Thereafter paintings are the most reliable references. As it happens, the Period from AD 1000 to 1300 was the golden age of realistic painting in China. Consequently, the carriages in the streets of the Song dynasty capitals Kaifeng and Hangzhou are well documented. However, realistic painting suddenly became very rare after 1300, so that there is a large gap in knowledge from that time until the arrival of photography in China around

1860, a period of more than 500 years. This is why the ROM carriage is so important. Before its arrival, all that was certain was that this type of carriage did not exist before 1300, and that it was the most common type after 1860. It is still not known when these carriages came into regular use, but from the ROM example, it is safe to say that it was well before the date of the earliest photographs.

The seemingly oversized axle of the late carriages was needed so that their wheels would fit the old ruts cut into the roads by centuries of ox-cart traffic. This standard dates to the year 221 BC

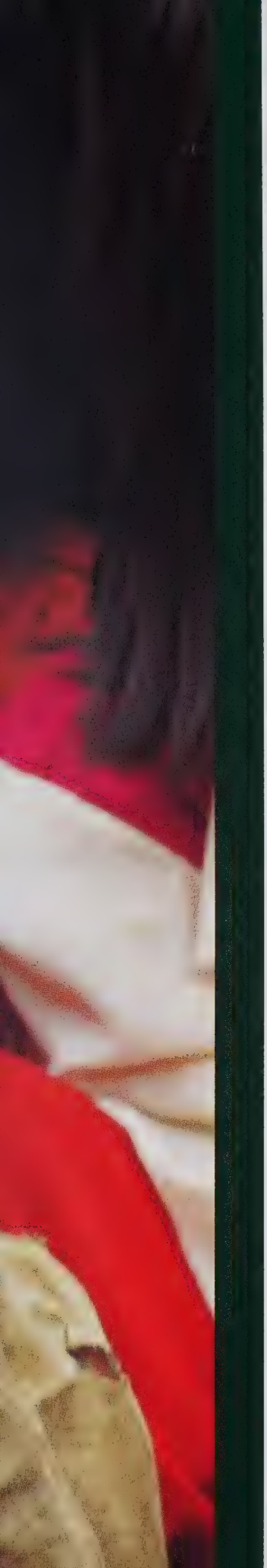
Furthermore, the carriage at the ROM provided an opportunity to document accurately the construction of the distinctive Chinese wheel. (See *Build Your Own Jiaoche.*) All known earlier attempts contain several fundamental errors, simply because the authors never saw an actual example.

The type of animal used to pull the carriages is another consideration in their construction and this too changed over time. Tomb models of two-shafted carts for passenger transportation dating from the Han dynasty (206 BC to AD 220) are found with both horses and oxen, but from about AD 200 oxen are used almost exclusively. The carts in Song dynasty (AD 960–1276) paintings are also mainly drawn by oxen. However, the ROM's carriage and others like it were drawn by horses or mules only. An ox would not even fit between the shafts.

There is one last feature of the Chinese carriage that provides a remarkable continuity in design. The later carriages have a narrow body that is about half the width of the earlier carriages, yet the length of the axle remains virtually the same. This seemingly oversized axle of the late carriages was needed so that the wheels would fit the old ruts cut into the roads by centuries of ox-cart traffic. This standard dates to the year 221 BC, when the First Emperor of China decreed that the gauge of all carts in the empire should be six of his newly standardized feet, or 166 cm. In sharp contrast to the rapidly changing technology of our world, the Chinese carriage at the ROM represents a technology that stayed relatively consistent and effective for more than two thousand years. ❁

The narrow iron tire with protruding nail heads (facing page) cut paved roads to shreds but was very effective for travelling the more numerous unpaved roads. This side detail (top, this page) shows some of the more than 400 nails required to enable the wheel to withstand horizontal torque. To prevent the spokes from splitting near the tenons at the tongue and foot, they are reinforced by iron rings, which are kept in position by a nail through an ornamental, triangular tag.

Ba Na children of Gia Lia province, Vietnam. The Ba Na are one of the many ethnic groups living in the small but densely populated country.



Why We Are in Vietnam

Collecting specimens in remote regions of Vietnam is an emotion-packed experience

Robert Murphy

It's 5:00 am somewhere in the Central Highlands of Vietnam. I'm not sure where, because the local village has no name. The sun is starting to rise and I've been awakened by the voices of Ba Na children chatting just outside my tent less than a metre away. They're talking to wake me. Their volume slowly increases as they wait for me to emerge from behind the cloth doors and mosquito netting. It's as though they're waiting for me to come on stage from behind curtains.

I've learned to sleep through the crows of our caged roosters near my tent, but I can't escape the voices of children. My eyes burn from a lack of sleep. The old cliché about sand in my eyes has renewed meaning. For more than a week now the schedule has been the same. My body aches from the 20-kilometre hike that took Nikolai, my Russian colleague, and me through streams and up waterfalls last night. We collected one specimen of a new species of treefrog, and two specimens of an aquatic lizard, a species previously known only from two other specimens. I don't want to get up. I need sleep—just one night off this schedule in a real bed. And worst of all, although I'm sleeping next to a coffee plantation, there's no coffee brewing.

By 5:30 I hear the voices of adults. Excitement begins to stir. I feel like a kid anticipating gifts on Christmas morning. The Ba Na hunters have come with animals that they collected during the night. For the next two hours I gaze into bags of frogs, toads, lizards, and snakes and negotiate prices with local tribal ethnic minorities and Vietnamese farmers who we've engaged to help us document the biodiversity in the Central Highlands.

Bingo! In one bag there's the second specimen of a new species of treefrog, and in another, only the fourth specimen of a tree lizard which was known to science some 60 years earlier and hasn't been seen since. Ah, Christmas in June in the Central Highlands of Vietnam. Yesterday the animals were different, but the story was the same: new species and new records of known species for Vietnam.

Robert Murphy, a curator of herpetology in the Centre for Biodiversity and Conservation Biology at the Royal Ontario Museum, is the leader of the ROM's research in Vietnam

PHOTOGRAPHY BY AMY LATHROP

Faces of Vietnam (clockwise from right): Exotically dressed by Western standards, this woman wears the everyday clothing of the Dao minority, who live in Ca Bang province near the Chinese border. ROM curator Bob Murphy eventually charmed a group of rural children near Buon Me Thout, Dác Lác province. A cyclo (tricycle-taxi) driver, sporting his American tie, enjoys a beer in Hanoi. The faces of BaNa women of Gia Lia province reflect a hard life.

Am I really insane to go to the malaria-ridden, dengue-spewing, plague-brewing jungles of Vietnam in search of venomous snakes and poisonous toads? Is it just the pursuit of a little boy's dream? The quest of discovery? Adventure? Arm-waving, attention-getting antics, otherwise sold as marketing? Machismo? A requirement of the job? And how does one convince onself, and more importantly one's family, that all this biodiversity exploration is worth flying half way round the world for up to two months at a time, and twice a year?

My favourite definition of biodiversity is that it's a measure of the Earth's health. The greater the number of species, the healthier our planet. Biologically, Vietnam is a remarkable place and the more we dig the greater the treasure. It's just fantastic. Exhilarating, simply unbelievable. Consider that this country is about one-third the size of Ontario. However, unlike Ontario, Vietnam has a population of approximately 80 million. It also contains almost nine per cent of the world's species of birds, four per cent of all amphibian and reptile species, and seven per cent of all species of mammals. It's impossible to estimate the proportion of Vietnam's insects because they are largely unknown. More than 80 per cent of the species found by ROM curators Dr. Doug Currie and Dr. Chris Darling are new, that is, not previously known to science.

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In terms of amphibians, the official list for Vietnam includes just 80 species. A new list, which is about to be published, raises the number of frog species to 100. ROM-based fieldwork and research has added more than 40 additional species to this number, and we're just getting started. At the current rate of discovery, the total number of Vietnamese amphibians will reach, if not surpass, 200 species within the next five years. The situation for reptiles is very similar, except that the starting number of species is about twice that of the amphibians. The discoveries just don't stop.

The existence of this mega-diversity is not too surprising given that only five per cent of Earth's surface is covered by tropical rainforests, and yet this little ecosystem is estimated to contain as much as 90 per cent of Earth's total number of species. Considering the wars that dominated Vietnamese life for past centuries, it's little surprise that many species remain to be discovered.

Even so, the nature and extent of undiscovered species is striking. Consider the 1994 discovery of the very large false antelope, *Pseudoryx nghetinhensis*, which shook systematists. And then only two years ago, there was the discovery of a giant muntjak, or hog-deer. Two previously unknown species of mammals! This is the good news. The bad news is what has happened, and what continues to happen, to the Vietnamese forests. In 1943 about 67 per cent of Vietnam was covered by forest. By 1991 this figure had shrunk to about 26 per cent. Although Vietnam is actively reforesting, thus far achieving almost 30 per cent afforestation, less than 17 per cent of the present forest is natural forest, and less than nine per cent of the original forest is relatively undisturbed. Unfortunately, despite a 1995 government ban, the destruction of the primary hardwood forests in Vietnam continues at an alarming rate. Unless something happens soon, there will be no primary hardwood forests remaining in Vietnam in just 10 years. After the forests of Vietnam are gone, those of neighbouring Laos and Cambodia certainly will be next.

The rate of deforestation in Vietnam must decelerate and, we must hope, soon. Vietnamese environmental laws are far ahead of those in Canada and the United States, but there's no effective means of enforcement, and, worse, corruption is rampant. Vietnamese environmentalists, such as those in the Ministry of Forestry and the Institute of Ecology and Biological Resources, are frantically working to find regions of high species diversity and endemicity—areas that contain species found nowhere else on Earth—and then obtain protected status for them either as nature reserves or national parks.

PHOTOGRAPHY BY AMY LATHROP

Human Life in Vietnam (clockwise from right): One of the many logging trucks transporting a resource that is being uncontrollably depleted. The ROM team spent an evening in the home of Bui Van Thao, his wife Bui The Nguyen, and their son Va Thi Tuyen. The family provided a daily supply of fresh fruit. Getting to work by public transport in Dác Lác province. In the evening, vendors at stands sell grilled meats, rice, and tea. A typical Vietnamese rural home has a cement porch for drying fruits and vegetables such as peanuts and mantioke.

We help. We take our expertise to Vietnam and assume the roles of advisers. The samples we bring back to Canada are subjected to expensive, sophisticated molecular technologies which help to determine species identities and the boundaries of their distributions. After analysis, we then advise the Vietnamese biologists of our results, and of the uniqueness of their fauna.

Why did I choose to go to Vietnam? I don't like the tropics, or perhaps it's more that the tropics don't like me. I'm from Texas and a desert rat at heart. I thrive in dry heat. Given my very low blood pressure, I don't do well in either cold weather or humid heat. But I had many reasons to go to Vietnam. Three stand out. The first is that I've never understood the word "No." Vietnam was closed to most outsiders, which I took as a "No," and this posed a challenge for me. Then in 1992 I began working closely with Russian colleagues to understand the evolution of diversity of Caucasian Mountain lizards in which a number of species are uniparental: they're all females—males don't exist. During evenings lit only by candlelight (Armenia was having a minor conflict with Azerbaijan over the Ngoro Karabach Armenian enclave, and a revolution had just occurred three months earlier in Tblisi, Georgia), my dear friend Professor Ilya Darevsky of the Zoological Institute of St. Petersburg would tell stories of his adventures in Vietnam. Hoping to have found a back door, and not knowing what to expect, I begged to go along on one of his excursions. This couldn't be any worse. I was already in a war zone.

Disturbingly, people believe that if we lose the forests, and along with them 80 to 90 per cent of our species, then we can rely on "science" for salvation. Wrong. Unfortunately, the statistics are against us

My second reason was that to me Vietnam was also a paradox. I attended university in the late 1960s to stay out of Vietnam. And now here I was doing everything possible to get into Vietnam. I must also admit that after 20 years of intensive ivory-tower research, there was a lack of enchantment in the academic game. For me, research had become too routine, too assembly-line, and purpose was absent. After years of convincing myself that a life of basic research was perfect, I backtracked. And then there was marketing. Could I be one of the first into Vietnam? If so, then money should follow. And what about purpose? Could I really do something meaningful? Could I escape the ivory tower?

The third and most important reason of all dates back more than a decade to one of the most profound events in my life. In 1984, at the age of 13, my eldest daughter was stricken with cancer. I watched this beautiful young woman go through two years of life-saving, chemotherapy hell. Nothing else has had a greater effect on me. I despise feeling helpless yet there was virtually nothing that I could do except hope. Life took on a new perspective.

Over a period of several years, things jelled. Each individual experience played a significant role, but none in itself would have been sufficient to create the drive and determination that now possesses me. However, all melted into one in the Caucasus.

So why is Vietnam so important to me now? Why do I leave my family for three to four months each year, and why do they tolerate an absentee spouse and father? Consider some simple statistics, which are not tree-hugging eco-babble. And consider statistics that relate to our children, for nothing is more important. For us in the developed world, 118 of the top 150 pharmaceuticals (79 per cent) are derived from natural products. One in every 125 species of plants has yielded a major pharmaceutical. Now consider that only 1100 of the worlds 365,000 known species of plants have been assayed for their medicinal properties, and that one species of tree becomes extinct every day. The estimated loss in revenues from natural drugs owing to extinction is a whopping US $600 million each year. What a research grant that would be. And the numbers are worse for animals and microbes.

Disturbingly, people believe that if we lose the forests, and along with them 80 to 90 per cent of our species, then we can rely on "science" for salvation. Wrong.

PHOTOGRAPHY BY AMY LATHROP & DOUG CURRIE

In the field in Vietnam (clockwise from right): Myriad exquisite butterflies live in Vietnam, including this bush-footed species. The 1997 ROM field crew at Dak Kiem River camp in Yok Don National Park, Dác Lác province. Access to the park was via elephant. A gliding male treefrog from Hia Duong province, graceful plant-hoppers, and a large female frog.

Unfortunately, the statistics are against us in this regard. Scientific attempts to create new classes of miracle cures usually end in failure, although sometimes in short-term success. Only one in 10,000 synthesized pharmaceuticals is effective for any significant period of time. So, as a species, are we really so arrogant that we think we can outwit 3.5 billion years of evolution? After all, like all other life, we are only bags of chemicals trying to reproduce and maintain ourselves at the expense of other species.

The pharmaceutical companies realize the futility of the "creative" approach and have heavily invested in natural-products explorations. The ironic aspect of all this is that the vast storehouses of future medicines exist in developing countries. These resources are being lost because of our over-consuming culture. Families in developing countries can't afford the medicine that we make from their forests, and we can't stop consuming their forests before the medicines are discovered for us. The single largest importer of Vietnamese coffee, which is grown on slash-and-burn rainforest land, is North America.

I return home and recall Vietnamese experiences. Trash cans line Toronto streets once a week. What we in the developed world consume and throw away is shocking. Just imagine the world when the more than one billion Chinese reach the same level of development

So what does it feel like, discovering a new species? The emotions are so convoluted, the adrenaline and dopamine both so pervasive, that the experience is indescribable. Years ago when I first started in the business, it was sheer glee. I'd jump up and down, and hoot 'n' holler until I was hoarse. And now? Well, I still do the same most of the time. All this excitement—even though it averages out to an every-other-day experience deep in the forests. And then I become sullen. The reality is that there's little hope for the survival of these new species beyond 10 more years. This is the harsh reality that we work against. I used to walk through forest streams at night wondering what the next discovery would be. What was above the next waterfall? What was in the leech-ridden marsh? With no exaggeration, I now walk through the forests and wonder if a leaf of some undescribed plant would have saved my daughter the two years of chemotherapy that she had to endure.

I return home and recall Vietnamese experiences. Trash cans line Toronto streets once a week. What we in the developed world consume and throw away is shocking. We who make up five per cent of the world's people consume 30 per cent of the world's resources, wage wars to maintain this level of consumption, and produce 50 per cent of the world's waste. Just imagine the world if, or rather when, the more than one billion Chinese reach the same level of development.

In Vietnam, one Canadian assistant and I got into a friendly argument over trash; I was throwing cans and paper on the ground, and the crew was cleaning everything up and lecturing me about the virtues of a clean environment. As we were leaving, another argument ensued; the crew wanted me to leave the remaining 50 kg of rice. Give something away? I sold it at cost saving someone a 20-km ride to the nearest store. A fight broke out over the rice until we confirmed that it had been sold, and at face value—no breaks for anyone. And our precious trash bag? We had no sooner climbed aboard the truck than six people started fighting over the rights to our trash. They pulled the plastic bag apart and dove in, gleaning useful objects such as tin and aluminum cans and plastic bottles. The wind dispersed what was truly useless. Trash. What a symbol of success.

Experiences such as these make me realize that we have the responsibility for helping conserve Earth's biodiversity, if for no other reason than to protect these resources for future medicines, which probably only we will be able to afford for our children. We must change our ridiculous intemperate habits. If we don't act now to create conservation strategies that are effective, then the Earth's fate will be the rapid destruction of the majority of diversity that we rely on for survival. Without these resources, there may be little hope for human survival itself. What a horrible fate for such an intelligent species.

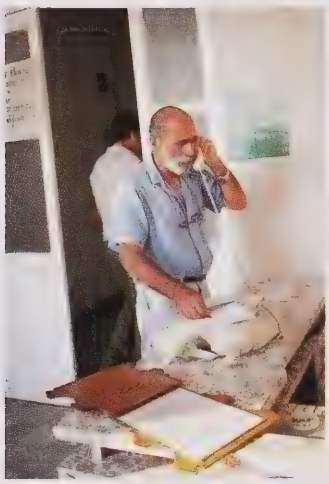
PHOTOGRAPHY BY AMY LATHROP

THE HOUSE IN THE WATER

An unprecedented find may open a window onto the past of Cuba's ancient Taino people

DAVID M. PENDERGAST

ARCHAEOLOGISTS HAVE TO BE INCURABLE OPTIMISTS; why else would they do such things as we did last year in Cuba (*Rotunda,* volume 30, number 2, fall/winter 1997, pages 28-35), up to our hocks in the mud beneath the blazing Caribbean sun? Yet when we returned in May of this year for a second season at Los Buchillones, near the midpoint of Cuba's north coast, I was not wildly optimistic; I thought we were back for a simple extension of what we had learned about Cuba's ancient Taino inhabitants in 1997. Wrong; I was wrong as wrong can be. But at least, in this case, I cannot look back now and say that if I had just got things into the right perspective I could have anticipated what we'd find. No one, no matter how optimistic, could have used what we knew when we started work this year to foresee where that work would lead us.



Dr. Jorge Calvera (above), the Cuban co-director of the Taino village excavation, makes his daily series of phone calls. The sandbag-and-plastic-sheet dam (facing page) is constructed around a group of posts emerging from the seawater over the Taino village site.

To understand why we approached this year with a specific game plan, and why the plan was transformed by the end of the first day of digging, you have to recall my 1997 tale of the last half-century of the site's history. Put simply, until the 1940s Los Buchillones was about 50 metres wider than it is today; swept away by the relentless pounding of the Caribbean, the dry land of the site has given way to the underlying sandy clay that is now part of the sea bottom. From the sand and seagrass protrude short, dark barnacle-encrusted cylinders of *lignum vitae,* the remains of posts that form circles, ovals, and rings. A first in Taino archaeology, the more than two dozen post groups we have now recorded represent the houses and other buildings of the ancient people. As the sea has destroyed the site's upper soils it has given us evidence we would surely not otherwise have known was there; on balance, I think we can now say that we have gained more than we've lost.

This year's work was to be straightforward: build another of our sandbag-and-plastic-sheet dams around a group of posts, pump out the metre or less of water, and see what else the seabed holds besides the posts themselves. Of course, the dam-and-pump part of that sentence is the verbal embodiment of a week's work, but still the task seemed simple enough, because our expectations could not be very high. I thought

David M. Pendergast is vice-president for Collections and Research, Royal Ontario Museum

that, given the scouring action of the Caribbean, the most we would encounter would be cultural materials too heavy for the water to move: stone tools, thick pieces of the large circular pottery *burenes* on which the Taino cooked cassava bread, and with the best of luck possibly a bulky wooden figurine. It is wise to keep one's expectations low, because then almost any outcome is a pleasant surprise. Until the end of our first day of work, though, I had no idea how far below the mark my vision of the season's product was.

We arranged a few more than 800 sandbags in a semicircle that duplicated the form of a half-ring of posts right at the water's edge. I chose that group of posts, in consultation with Dr. Jorge Calvera, my co-director, Lic. Juan Jardines, and André Bekerman, on the simple ground that the dam that would be required was the easiest one to build. With our steadfast pump moving water with enough force for firefighting, we soon saw the shallow Caribbean waters replaced by a damp and rather repulsive-looking seabed. Although the semicircle of posts seemed less clear now that it was in full view, we resolved at day's end to lay out a control grid and start excavation as soon as possible. The decision was spurred by the fact that installation of a sump to allow effective pumping of the continuing inflow of water had brought us our first find of the season: a large, nearly complete wooden dish, the first at the site

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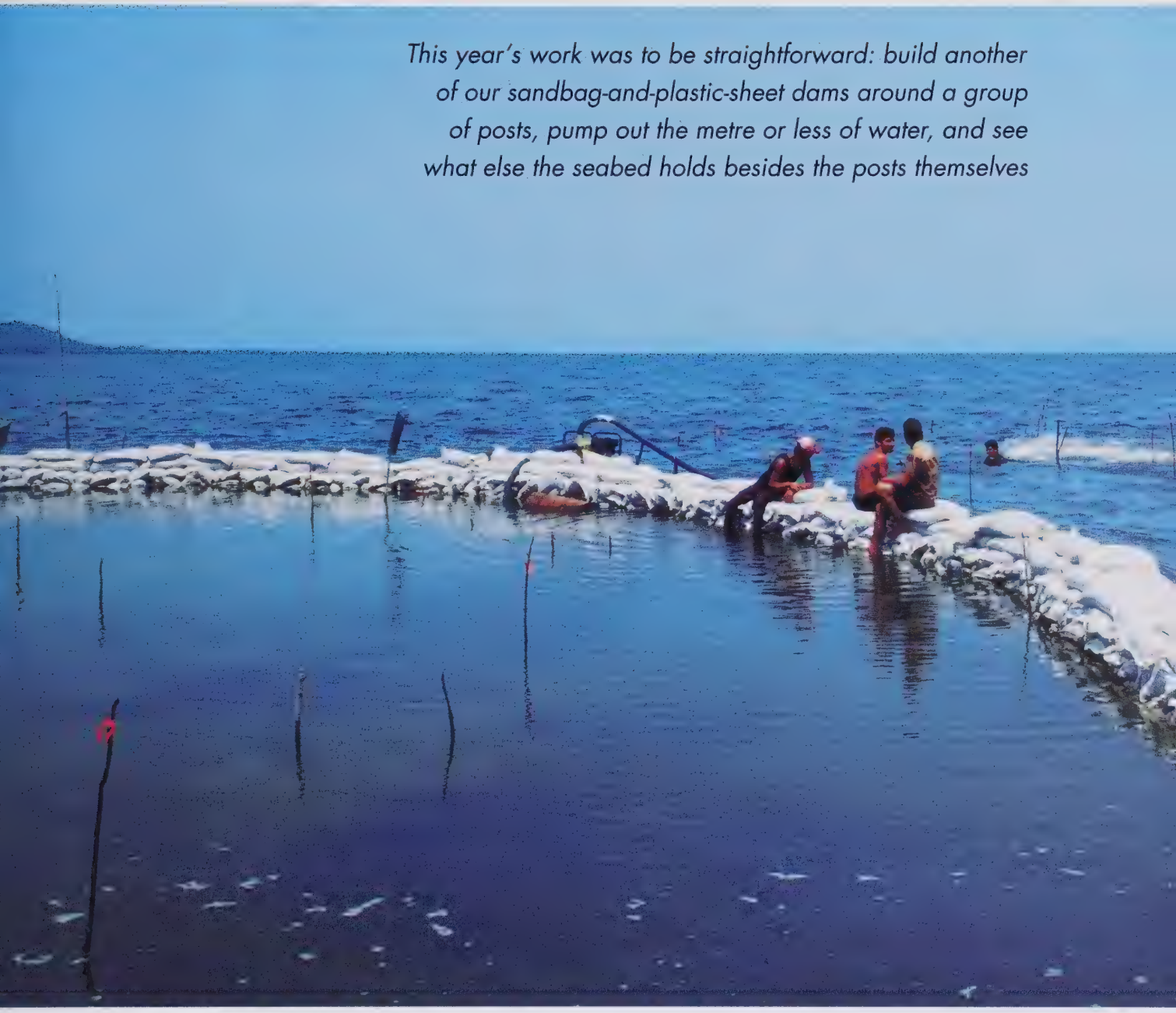


to come from its ancient context rather than a spot into which the waves had tossed it.

With the grid in place, we commenced digging—no mean task in sticky clay mingled with sea-bottom goo. We thought that the presence of the dish might augur well for further discoveries of lightweight objects around the posts. As the day wore on we found more and more sections of small smoothed sticks such as we had seen in the previous year's excavations, and we also encountered some considerably larger pieces. Tracing one showed that it extended for several metres, and in the course of the work a second appeared by its side, then a third. At the appearance of the first long pole I thought that we were seeing again the effects of the sea's churning, but the emergence of the second pole changed my perspective. At day's end, as we were walking along a heap of backdirt piled atop the narrow beach, I made a casual observation about the results of the work to my wife, Elizabeth Graham, who had just arrived the day before to join the operation. Overhearing my comments, our Cuban colleagues clustered round, and I was led into a mini-lecture atop the damp backdirt. The long poles were rafters, in correct alignment with the posts of the house wall. Rising into view as we cut away the muck were the remains of a house so beautifully preserved that the building could almost be said to be intact.

On the next day, prepared now for the appearance of more rafters as well as stringers (the horizontal sticks on which the leaves of the thatch roof would have been hung), we could give form to what had been more of a probing than an excavation. Wherever we could step without risking major damage we searched with trowels and bare hands for additional pieces of ancient architecture.

PHOTOGRAPHS COURTESY DAVID PENDERGAST

The first find of the season was a large, nearly complete wooden dish (above), the first at the site to come from its ancient context rather than a spot into which the waves had tossed it. After the water was pumped out of the dammed area, a control grid (facing page) was put into place for the excavation.

As we traced rafters inwards for metre after metre from the circle of posts, a shout went up from Nelson Torna, one of the two men responsible for attracting our attention to the site. "There's thatch here!," he cried over the roar of the pump, and I shot back something that I will now claim, for the sake of propriety, was a Spanish equivalent of "Get a life, man!" Choking back my cynicism, I stepped gingerly over to where Nelson was squatting next to a rafter. As I looked down at what his trowel had revealed, there before my unbelieving eyes were unmistakable wads of palm-leaf thatch. If the house was not intact, it was about as close to that state as anything ancient can come.

The world of archaeology is not one of contests; firsts are important not because they beat someone else to the punch but because they are major additions to our knowledge about the past. The Taino house at Los Buchillones is such a first. Until now the world has known Taino architecture from a very limited early Spanish description, a single drawing, and the post patterns at Los Buchillones. This year's work, limited as it was, has begun to give us a window on Taino life that, when we have opened it fully, will make the people far more real, more tangible, than they have ever been before.

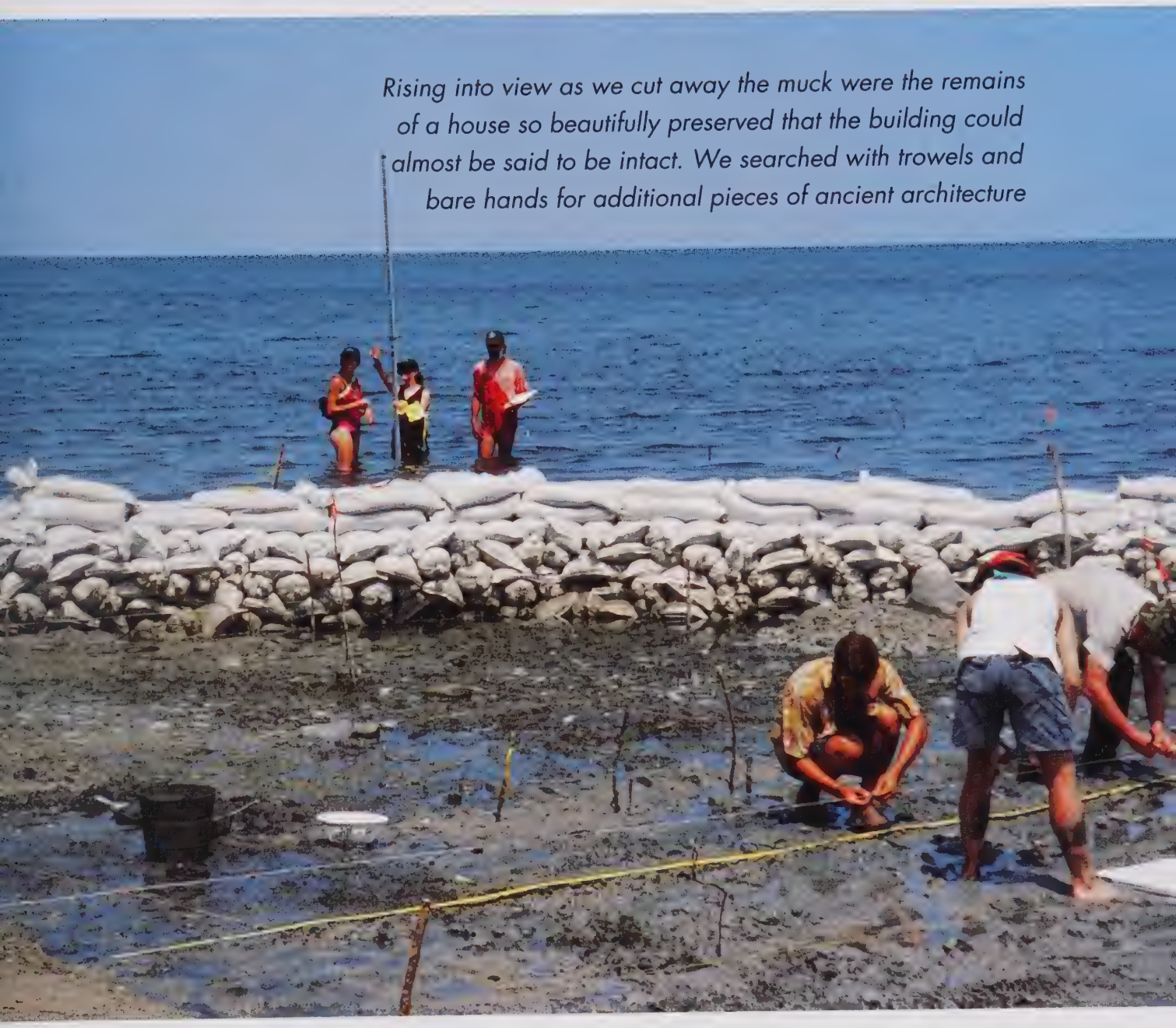
I have been asked how the discovery compares with my work in the Maya area, and the answer is simple. Once again, it is not a matter of ranking this discovery against ones I've made in Belize, but rather of seeing the Taino house in the mirror of my Maya research. The contrast is striking. Although there are unimaginably huge holes in our knowledge of ancient Maya life, we have always been able to attempt to understand that life by looking at the remains of houses, whereas until now we have had to try to understand Taino life through the medium of portable objects alone. Now we have taken a step towards seeing the Taino in the setting in which they passed from birth through life to death, and although the pulling back of the curtain has only just begun, the picture it reveals is remarkably rich.

Because our dam could only hold back the seawater itself, we struggled to reveal more and more of the house in a constant flood. Water spurted in through the seabottom, fed both by the Caribbean and by the lagoon that lies behind the narrow strip of beach. We made matters worse as we cut into the beach to reveal the house's two great centre posts, forked giants sev-

en metres in length, one of them still whole and solid enough that it could be used in house construction today if the ancient methods were still in practice. Finally, with the northern half of the 18-metre circular structure partly exposed, we were defeated by time and hydraulics, and we closed the season with a great deal left to do.

What we know now is that although the structure we selected for excavation is a dwelling, it is so spacious that it must have been either a communal residence or the home of a large extended family. Around the building's exterior, the area from which the wooden dish came, we found quantities of pottery fragments, a number of wooden artifacts that included some unfinished objects, a few stone tools plus many chips of chert, and large numbers of animal bones as well as other food refuse. Among the food remains were two hog-plum seeds, another amazing bit of preservation in this virtual time-capsule situation. Within the house is a large hearth packed with charcoal, and some artifacts appear to lie in this space as well. All of this evidence supports the identification of the building as a house, and we are tempted to see an inner ring of posts, each of which is encased in a group of small vertical sticks, as a setup for the hammocks that the Taino are known to have used. The quantity and variety of evidence are obviously great, though the picture is still very far from complete.

Rising into view as we cut away the muck were the remains of a house so beautifully preserved that the building could almost be said to be intact. We searched with trowels and bare hands for additional pieces of ancient architecture



It was the water that left us without a complete picture; we probed as deeply as we could amidst the freshets and pools that we constantly faced, but in the end we were left at least a half metre above the base of the giant pile of wood, frustrated by the mud soup in which we could detect objects only by touch. Once we have worked out ways to conquer the frustrating situation, there is no doubt that full exploration of the house will do much to illuminate Taino life in a site that we now recognize is the largest recorded in Cuba. With everything from the great centre posts to the thatch available for radiocarbon dating, we should soon be able to tell the house's age, but we already know that it is most likely to lie between the early 13th and the late 16th century. Certainty on such points is, however, accompanied by some very large questions to which we may never have answers.

The first set of questions about the house revolves around a single point: how is it that the house has survived in such excellent condition? Easy responses come quickly to mind, but none is really satisfactory. A constantly damp environment, especially one in which oxygen is absent, is excellent for preservation, and the documented rise in the level of the Caribbean over the past millennium could have created such ideal conditions. However, evidence indicates that the water did not overflow the land where the house stood, so how could the timbers have fallen into properly wet soil? The clay that underlies the site, and forms most of the seabed in the area that the ocean has eaten away, is locally famed for its medicinal properties, and might have contributed chemically and physically to preservation. But how could the house have settled into the clay bed, which was covered by sand and soil? I will not burden your minds with an exploration of all the facets of this conundrum, but I do want to say that if the questions are large regarding the posts, rafters, and other wood, they are gigantic when it comes to the thatch. Here questions deepen into mystery.

Part of the crew (above) waits for transportation to the site. At this point in the excavation (facing page) the timbers of the Taino house are revealed.

I have seen many abandoned thatch buildings in the Maya area, and my observation of such structures has helped a great deal in the work in Cuba. Rates of decay and collapse vary greatly depending on local conditions, but one thing is clear: palm leaves, even when they are still on an intact roof frame, begin to lose their soft parts soon after a structure is abandoned, and even the leaf ribs last only a short time once the roof has collapsed. The presence of both ribs and fronds means that the entire structure must have been buried in a protective stratum very quickly following its abandonment. It is absolutely clear from the condition and location of all the timbers that the house was not toppled and buried in a hurricane or other catastrophe; instead, it settled gently into the bed in which it rested until we came along. All evidence points to Taino abandonment of a village fully intact, but none of the evidence has yet given us a picture of the events that followed—and perhaps none ever will.

The more than 220 wooden artifacts that have turned up on the shore and in the lagoon compound the uncertainties. If the people of Los Buchillones departed voluntarily and in an orderly manner, rather than in full flight in the face of an oncoming hurricane, why did they leave behind such a quantity and variety of easily portable things? Why, in particular, would they have abandoned elaborate wooden dishes with shell inlay, miniature wooden stools with elaborate animal heads, and even the figures of their gods?

The answer could be that their departure was not voluntary, and because we can rule out nature as the agent, one possible explanation is that the Spanish drove the people from their homes. Radiocarbon dates from the 17th century, long after Spanish arrival, combine with one bit of worked European pottery to show that Los Buchillones somehow made it through the early decades of Spanish presence, when most of Cuba's native population was either killed or enslaved. We are light years away, though, from being able to show that any Spaniard ever set foot on the site. If indeed it

was Europeans who brought about the community's abandonment, a whole new set of questions emerges about how the place remained undiscovered for so long, and once again the speculative answers are far from satisfying. So it goes in archaeology; for every matter made clear, one or more new problems emerge to take its place on the question list.

To extend our work next February, and perhaps to provide answers to some of the questions that plague us now, we shall have to construct a caisson to surround the house. The caisson will have to protect the entire house from water inflow, and hence will have to surround not only the part of the house that we revealed and then reburied at season's end to protect it from the action of the sea, but also the half that lies beneath the beach. In addition, we shall have to use a movable, changeable platform that will allow us to lie above the house remains as we deepen our excavation. Both the caisson and the platform will make the work costly and complicated, and we will require longer field seasons than in our past two years on the site. From an exploration aimed at establishing the potential of Los Buchillones, the work has suddenly mushroomed into a fullblown excavation project for which the prospects are almost incalculably remarkable. Optimism will clearly be the order of the day from this point on. ❦

It is absolutely clear from the condition and location of all the timbers that the house was not toppled and buried in a hurricane or other catastrophe; instead it settled gently into the bed in which it rested until we came along

The First Red

A ROM geologist takes a new approach to the search for the missing human link

Robert Walter

SEA EXODUS?

IF IT IS TRUE THAT EARLY HUMANS EVOLVED in and then migrated out of Africa, what routes did they take, when did this happen, and where could modern scientists expect to find evidence of this migration? Scientists agree that the two most logical routes would be along the ancient Nile River and along the Red Sea coast.

Until recently, all attention has been on the Nile. No one has actually explored the Red Sea coast. Yet if my interpretations of finds in the Danakil Depression of Eritrea are correct, then this small country bordering the Red Sea may hold the key for decoding the story of early human migration.

As a geologist with a keen interest in human origins, I adopt a somewhat different approach from that of many palaeontologists and archaeologists. I prefer to look at fossils and artifacts as elements of the geological record, because it is my view that they have little intrinsic scientific value unless they can be properly placed in geological time and context. Initial research carried out in the summer of 1995 indicates that the rocks of the Danakil Depression, and the fossils and artifacts found there, can tell us a fascinating story about when, where, and how human evolution occurred, provided we can read the clues and ask the right questions.

Tesfaye Yemane (left) and Tesfalidet Andemariam found a small piece of hippopotamus tusk while scouring the inhospitable desert of the Danakil Depression near the town of Badda.

PHOTOGRAPH BY ROBERT WALTER

* * *

Africa is the cradle of early hominid evolution. Nowhere else have hominid fossils been found dating before about 1.8 million years ago. From about 4.5 million to roughly 2.3 million years ago the Australopithecines were the sole hominids on Earth. By 2.3 million years ago the genus *Homo*, our own direct ancestors, had appeared for the first time, and for a million years or so *Australopithecus* and *Homo* co-existed; but only *Homo*, apparently, had the ability to make stone tools.

A view of the North Danakil Depression shows an area that may prove rich in hominid fossils.

Homo habilis, arguably the oldest of this lineage, means "handy man" and was so named by Louis Leakey because of the association of these fossils with crude stone flakes and choppers at Olduvai Gorge. *Homo erectus* had evolved by 1.8 million years ago, and soon thereafter appeared outside Africa for the first time, migrating into southeastern Europe and Asia, and even to Java. The migration of *Homo erectus* is often called the "Out of Africa" hypothesis, but we still don't know exactly when, where, or why this migration occurred.

Between 200,000 and 100,000 years ago a second hominid migration from Africa took place. This time it was ourselves—modern humans (*Homo sapiens*)—and it is believed that we quickly spread throughout the Old World. The earliest evidence of *Homo sapiens* outside of Africa is in the cave deposits of the Levant dated to between 90,000 and 100,000 years ago. Although the last 200,000 years are poorly documented in Africa, there is compelling palaeontological and biochemical evidence that points directly to Africa for modern human origins. And yet the origin and dispersal of *Homo sapiens* is one of the most contentious and interesting issues in human palaeontology today.

This brief timeline highlights what is known about when and where early humans evolved. However, there are major gaps in our knowledge primarily because of apparent gaps in the fossil record in Africa. On the one hand, the earliest hominid fossils, especially *A. afarensis* (the species to which Lucy belonged), are relatively abundant and well documented from four to three million years ago. On the other hand, the hominid record between three and two million years ago is quite sparse, and yet this is a time of major speciation

Robert Walter is senior scientist in the Department of Earth Sciences, Royal Ontario Museum

and change in the hominid family tree.

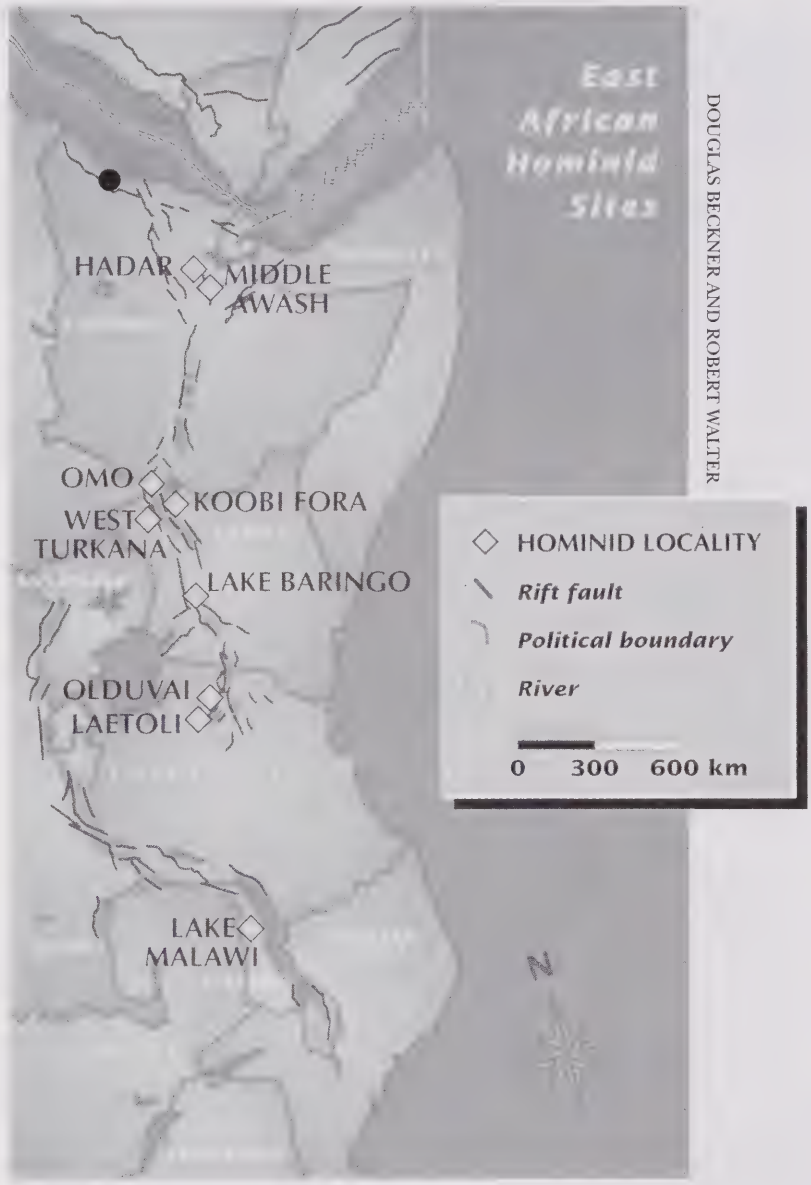
Similarly, the hominid record in Africa is relatively well known between two and one million years ago, but subsequently becomes patchy during the late Pleistocene, especially in the period between 500,000 and 50,000 years ago. Eritrea may well provide critical evidence to help fill one or more of these gaps.

* * *

I knew full well that August was not the time to be in the Danakil. I had worked in the deserts of Ethiopia south of the Danakil for many years, and I reckoned that it was going to be unbearably hot. Even my colleagues at the Department of Mines in Asmara, many of whom are former liberation fighters who spent years in the bush, urged me not to go, but it was the only time I could get away.

The Danakil Depression has been called the "Hell-Hole of Creation" by British author and explorer L. M. Nesbitt. For many it is a remote and inhospitable desert. For a geologist, especially one interested in human origins, the Danakil is paradise, and the attraction is enormous. I was accompanied by three intrepid Eritrean colleagues: Tewelde Medhin-Tecle from the Eritrean Department of Mines, Semere Solomon from the University of Asmara Geology Department, and geologist Michael Tesfaye, my close friend and associate for many field seasons. We were about to begin the first systematic survey of the Danakil Depression of Eritrea for its Cenozoic geology, palaeontology, and archaeology.

Our destination was Badda, a small Afar village in the northern Danakil Depression, situated about 90 m below sea level. I chose this location from aerial photographs and geological maps I had seen years before. Whether exploring for gold or fossils, geologists use maps and aerial photos to help pinpoint regions of interest. These tools provide important clues that must then be checked on the ground. The area around Badda seemed to have the right kind of deposits in the right geological environment to hunt for vertebrate fossils and prehistoric artifacts. We were looking for terrestrial sediments—sediments deposited by ancient rivers and lakes as distinct from marine sedi-



DOUGLAS BECKNER AND ROBERT WALTER

ments—that were deposited in the last four to five million years. This period spans the known origin, evolution, and dispersal of hominids in Africa.

Badda is at the base of the Red Sea escarpment, roughly 40 km from the nearest Red Sea coast and a two-day drive south of the port city of Masawa. The deposits near Badda were interesting geologically, but seemed devoid of fossils. I made a mental note to return to Badda during the winter and moved on to the next locality. As we drove eastward across the Danakil Depression to-

Research conducted by Robert Walter and his team in the Danakil Depression of Eritrea, near the escarpment of the Red Sea, is indicated by the large dot (top left). The map also shows the relative locations of previous hominid finds in East Africa.

wards the coast, it was apparent that we were driving over an ancient sea bed composed of corals and evaporite deposits, indicating that several times in the not too distant past marine water from the Red Sea had filled the Danakil Depression. I made another note to learn more about coastal marine geology and moved ahead. In the course of the next two weeks we located several Plio-Pleistocene fossil and archaeological localities in sediments along the base of the escarpment; nothing extraordinary yet, but certainly enough to justify the trip and to help plan for future expeditions.

A fossil-coral reef provided researchers with the unusual opportunity of examing such a formation without scuba gear.

* * *

Little scientific research has been done in Eritrea since the early 1970s because of the protracted civil war that ended in 1992 with the separation of Eritrea from Ethiopia. Until recently, Eritrea had never been explored for its human palaeontology and prehistoric archaeology. Since the mid 1950s the East African Rift Valley has been the most important region in the world for the recovery of early hominid fossils and prehistoric artifacts. The 4.5-million-year-old hominid fossils in Ethiopia and Kenya, the 3.5-million-year-old hominid footprints at Laetoli, Tanzania, the 3.2-million-year-old partial skeleton of "Lucy" from Hadar, Ethiopia, and the first appearance of the genus *Homo* together with stone tools dated to 2.3 million years ago at Hadar are but a few of these dramatic discoveries. Eritrea resides at the northernmost end of the East African Rift and, by sheer inference, it is likely to yield similar discoveries.

My interest in Eritrea is based on my geological experience in East Africa, mainly in the Afar region of Ethiopia. The Danakil Depression is merely the northern tip of the Afar, and shares the same geological history. This knowledge suggested to me that the Danakil Depression was a likely spot to find fossils and artifacts bearing on the story of human evolution. My two-week survey of the Danakil in 1995 was a pilot project intended to locate promising sites. I came back armed with excellent information that suggested my hunch was correct, and I had a much better understanding of the geology and the terrain.

* * *

Keeping my promise to return in the winter, on 25 January 1997 I was en route to Badda once again via a brief diversion to a large rhyolite volcano called Alid in the northern Danakil. Since

there is no direct route from Alid to Badda through the Danakil, we had to backtrack and take the coastal road along the southern tip of the Gulf of Zula. It was a rough, dirt track, turned slippery by rain, over yet another rugged volcanic mountain. It took us longer than expected to traverse this terrain and we found ourselves less than half way to our goal when dusk fell and it started to rain. January is by far the best time to be here, but the occasional rain turns the dirt tracks to quagmires.

We pitched our tents in the dark on the nearest high ground and cooked supper. I went to bed wondering whether Badda was as hot as I remembered. I had a much larger team with me this time, including Dick Buffler from the Institute for Geophysics at the University of Texas and two new colleagues from the Marine Biology Department at the University of Asmara. Henrich Bruggemann is seconded to the University of Asmara from the Dutch government. He studies marine fishes and he is helping the university set up a marine biology field station at Masawa. Mireille, his wife, is with the Museum of Natural History in Paris, and she studies modern corals. Because of the marine rocks and fossils I had found during my previous trip to the Danakil, I asked them along to help interpret whatever marine fossils we might find. This was a stroke of pure luck.

The next morning we awoke and broke camp. It was a brilliantly sunny day and spirits were high. We were perched on a long, flat platform about 10 m above sea level and about 100 m from the coast. As we waited for the group to return from morning ablutions, Mireille and Henrich called me. Wandering off a little earlier, Mireille had discovered that the platform was actually a fossil coral reef. I knew such coral terraces existed along the Red Sea coast, but we were not planning to study them until later in our schedule. Since we were here, we decided to look around.

What we found was nothing less than amazing. Within a short while Mireille and Henrich had identified most of the corals to at least the genus level, and with Dick had reconstructed the palaeoenvironment to an extraordinary extent. They deduced we had camped on the reef top of what had once been a shallow reef platform. Landward, we could see the reef top merge with a back-reef lagoonal environment as it lapped onto the volcanic rocks of the ancient coast. I was amused to watch

A hand-ax was spotted (top) in the reef. Tesfaye Yemane (left) and Dick Buffler examine the ancient coral (bottom).

Henrich and Mireille run over the reef with such exuberance, as I realized that this was probably the first time that they had ever seen the base of a coral reef without scuba gear, and they could see it in all its three-dimensional glory. We found corals with names like *Goniopora, Lobophyllia, Stylophora, Galaxea, Favites, Echinopora, Fungia, Herpolitha,* and *Platygyra.* We also found Murex gastropods, pelycepods, brachiopods, and molluscs — clams and oysters.

Looking up at the ridge of the Danakil Depression, a team member examines a small obsidian blade (close-up, top, facing page).

And then the real fun began. We started finding obsidian flakes, retouched stone tools made from jet black volcanic glass, in the back-reef deposits. The more we looked, the more obsidian tools we found encased in the cement-like deposit. We even found occasional large mammal fossils in the same sequence. We were all terribly excited because, to the best of our knowledge, nothing like this had been found before: obsidian tools in an ancient coral terrace. To add to the excitement, my best guess for the age of the terrace put us smack-dab in the window—200,000 to 100,000 years ago—for the emergence and dispersal of modern humans out of Africa.

Obsidian flakes and blades are hallmarks of early modern human technology. This was just the tip of the iceberg, as we found many more stone tools throughout the reef complex. We even traced the terrace for several kilometres in both directions, and everywhere we found the reef we found stone tools imbedded in it.

* * *

Why is this coral raised above sea level? The answer is found in ancient climate changes. We know, for example, that during glacial maxima when much of Earth's oceans were locked up in the polar ice caps, sea levels dropped dramatically. In fact geologists have learned that during the last two glacial maxima, roughly 20,000 and 150,000 years ago respectively, sea levels dropped as much as 130 m below the present level. During interglacial warm periods, such as the one we are currently experiencing, glaciers melt and sea levels rise. In fact, during the last interglacial period, roughly 125,000 years ago, sea levels rose about 5 m higher than present levels. Therefore, anywhere in the world today where corals formed 125,000 years ago there should be a fossil coral terrace at about 5 m above present sea level, like a bathtub ring around the ocean basin. In tectonically active areas, these terraces might be elevated even higher.

* * *

The significance of this discovery is that it demonstrates that early humans were using stone tools in a near-shore marine environment perhaps as early as 125,000 years ago or earlier. This is a novel concept, but until we get back to Eritrea and investigate these sites further, we cannot say who the hominids were or what they were doing with the tools. However, our working hypothesis is that they were probably early modern humans who were using the tools to harvest marine food sources, such as oysters, crustaceans, and possibly large marine and terrestrial mammals. The Red Sea coast would have been an excellent, constant food source for early hominids, once they had learned to harvest it.

Our hypotheses, about who made the tools and for what purpose, must now be tested. We must accurately date these corals, thoroughly study the geology and palaeoenvironments of the tool-bearing corals, and survey other coral terraces along the Red Sea coast for traces of prehistoric archaeology. In this way we will find out if there was a systematic use of the Red Sea coast by early humans and if the coast was a viable route for early human migration out of Africa.

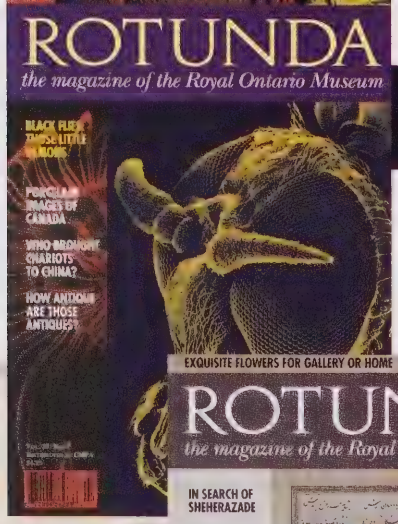
* * *

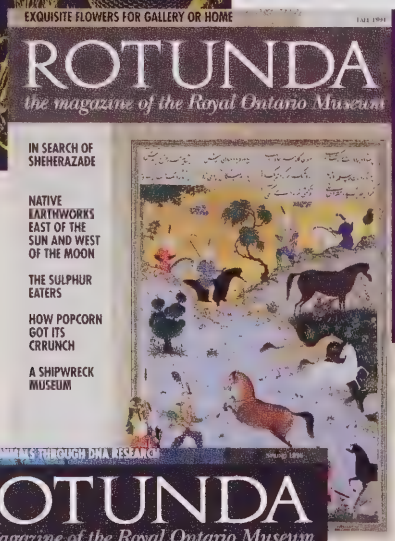
Future discoveries in Eritrea have the potential not only to expand the sample of known hominid species, but also to recover hominids and artifacts in temporal and ecological contexts not represented elsewhere in East Africa. This potential is starting to be realized already. An article in the 4 June 1998 issue of *Nature* announced the discovery of a one-million-year-old hominid skull from the Danakil region of Eritrea by a team from the University of Florence. This is the first hominid fossil found in Eritrea, but it will not be the last.

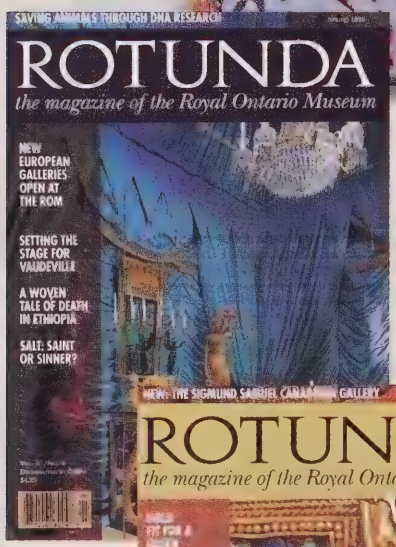
The collaborative spirit of our research team is a key to the project's success. Colleagues from the Royal Ontario Museum, the University of Asmara, the National Museum of Eritrea, the University of Toronto, the University of Texas, Iowa State University, Musée National d'Histoire Naturelle (Paris), and Dartmouth College are working together to unlock the stories in the rocks, fossils, and artifacts of the Danakil. With financial support from the ROM and the University of Toronto, we will return to Eritrea this fall. Stay tuned for further developments. ❦

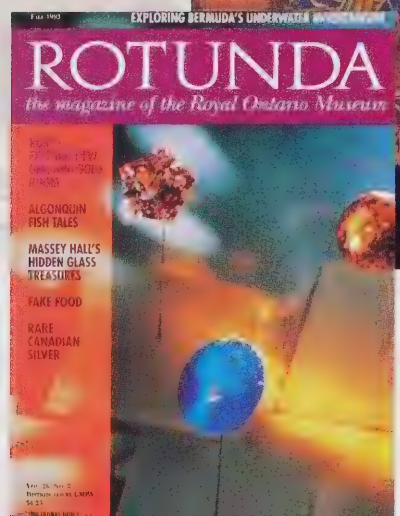
PHOTOGRAPH BY TESFALIDET ANDEMARIAM

Robert Walter, leader of the research in the Danakil Depression, with Salhe, who guided him up the Alid volcano.









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Depending on the garment, children's heirloom clothing may be stored hanging or flat.

Preserving Your Child's Heirloom Garments

CHILDREN'S CLOTHING CAN BE SAFELY preserved as heirlooms for future generations by following some simple guidelines for careful storage. Such measures will prevent damage other than that caused by the unavoidable effects of aging.

Once a garment has been worn, it should be cleaned before being placed in storage because stains may become more difficult if not impossible to remove as they set with age and, along with dirt, they provide a food supply for insects.

Contemporary textiles should be cleaned following the manufacturer's recommendations, whereas antique garments should be cleaned following the advice of a textile conservator. Pieces which can neither be washed nor dry-cleaned should be gently vacuumed using low suction and a soft plastic mesh screen, available at hardware stores, between the textile and the nozzle of the vacuum cleaner.

Garments may be stored hanging or flat, depending on their makeup, condition, and available space.

A garment suspended from a custom-padded hanger imitates the fall or drape that occurs during wear. There should be no creases or folds other than those created by the design of the garment. The width of the hanger should be checked against the shoulder width of the garment so that there is no risk of the hanger protruding through the sleeves.

PHOTOGRAPH BY BRIAN BOYLE, ROM

Padding the hanger to create volume at the shoulder line will help to distribute the weight of the garment over a larger area, thus providing better support for the drape. The padding is made by wrapping polyester batting around the hanger until the desired thickness is achieved. The idea is to create volume while keeping in mind that too much as well as too little padding can result in distortion of the garment. A cotton fabric should be used to cover and isolate the polyester batting from the garment. Soft light-weight cotton or acid-free tissue paper are perfect for adding volume in the sleeves or other areas that require a little puffing. When hung the garment should be enveloped by a cotton dust cover. This will protect it from handling and light, as well as from dust. The dust cover should fit loosely around the garment to prevent the formation of creases. Pillow cases make good ready-made dust covers for children's clothing.

Although hanging is often the preferred method, garments made of weak or stretchy material, or showing signs of wear, particularly at the shoulder or waist line, should be stored flat. Children's garments are usually small and can easily lie flat in boxes or drawers without being folded. If folding is required then a small roll of acid-free tissue or soft cotton should cushion the fold line to prevent crease marks. Plastic (polyethylene or polypropylene) or acid-free cardboard boxes are best for storage as they are constructed of archival material.

If a storage container made of non-archival material is used, such as a wooden drawer or ordinary cardboard, then the interior of the container should be lined with polyethylene plastic to decrease direct contact with the artifact. Poly vinyl chloride (PVC) plastic products are unstable and should not be used for storage. It is also wise to line all containers with a clean cotton fabric for added protection and to facilitate lifting the artifact in and out of the box. Again acid-free tissue and soft cotton are appropriate for garment-sleeve and leg-stuffing material. Also, the fold line of pleats can be gently cushioned with fine tissue to reduce marking. From time to time the garment should be refolded to prevent permanent creasing.

The ideal environmental conditions are between 18° and 25° C with a stable relative humidity of about 50 per cent. These conditions may be difficult to achieve at home. A realistic goal should be the establishment of as stable an environment as possible. Areas subject to drastic climatic changes such as unheated garages, uninsulated attics, or humid basements must be avoided as textile storage areas. In order to avoid water damage always raise containers off the floor and use polyethylene sheeting over shelving units.

Textiles in storage should be monitored and inspected for the presence of pests, mould, and other problems. Insect activity is easily monitored by leaving sticky traps on the floor next to a wall in close proximity to the storage site. Of course good housekeeping is the best strategy to deter insect infestation. Vacuum storage areas and inspect shelving and moulding for traces of insect residue, cocoons, or frass. Do not use moth balls but rather small herb sachets, and do not allow them to come into direct contact with garments because they contain oils that can stain textiles.

All fabrics in direct contact with garments—wrapping materials and dust covers, for example—should be washed and machine-dried before they are used. Washing removes finishes and machine drying will ensure that all shrinkage has occurred before the material is sewn into a dust cover. Unbleached or white cotton is preferable to coloured fabric because there is no risk of colour transfer.

By following these basic procedures, your small treasures should last for several generations.

ESTHER MÉTHÉ
Esther Méthé is a textiles conservator at the Royal Ontario Museum

ROM Answers

Dear ROM Answers,
We are very interested in discovering how the following family heirlooms originally would have been used. Would you also know the ages of items one and three?

The chair was brought from Ireland in the early 1900s. We believe it is a "nursing chair". It retains its original brass casters but the needlepoint upholstery was replaced some years ago. Its over-all height is 94 cm. The seat is 33 cm (13 inches) high.

We have always called the silver-plated basket a "bride's basket." It belonged to my husband's mother who was married in 1918. Would this basket have been carried by the bride, hence the handle? The height to the top of the handle is 42 cm.

We believe the brass container to be a brandy warmer. Its body is 10.2 cm high or 15.3 cm when the handle is raised. The top screws off to reveal a small brass tumbler inside.

We would be pleased if you could shed some light on these items before they are handed down in the family. We shall look forward to hearing from you. Thank you in advance.

R. J. H., Thornhill, Ontario

Dear Reader,
Thank you for your letter. Judging from the design of the turned front legs and the rather bevelled rococo scrolls on the back, I would suggest that stylistically your chair is likely to date from around 1840 to 1870. You do not describe the finish. Is the chair stained a reddish tone often found on mahogany and then covered with a glossy finish which may be varnish, shellac, or French polish? It is difficult to tell from the photograph but that is a common finish for furniture in the mid-1800s. The turned supports on either side of the back seem a bit plain for the period but they could have been intended to suggest something from the time of Charles II or a turned country chair from the 1700s. Victorian furniture often took design inspiration from a wide range of historical sources. This makes Victorian furniture difficult to analyse.

The low seat suggests that this was an individual bedroom chair rather than part of a set of dining room chairs or other furniture. Chairs such as this one often had an additional upholstered or wooden bar extending across the top, and were decorated with needlepoint by a lady of the house. Sometimes referred to as "prie-dieu" chairs, they could be used at the foot of the bed in Victorian times. The idea was that a person kneeled on the seat with arms positioned at the top to say prayers. Check the underside of the seat for possible labels or an impressed maker's mark.

Silver-plated baskets, such as the one you own, were manufactured in some quantity by factories in Canada and the United States from around 1900 to 1930. The name "bride's basket" seems to derive from the fact that they were often given as gifts for weddings and special occasions. I cannot recall seeing one in sterling silver.

The Royal Ontario Museum was recently given a silver-plated basket that was presented originally to an Ontario politician about 1923. Unfortunately, he died shortly after receiving it. The basket was stored with a small glass tumbler that sat inside it. In the tumbler, a flower holder, consisting of a lead weight with

If you possess furniture, silver, glass, metalwork, ceramics, textiles, or small decorative objects that may have an interesting past and have aroused your curiosity, this column is for you. Send a clear black-and-white photograph (or 35-mm colour slide) of the object against a simple background, providing dimensions, a description, any markings, or any known details of its history to: ROM Answers, c/o Rotunda Magazine, *Royal Ontario Museum, 100 Queen's Park, Toronto, Ontario M5S 2C6. Be sure to enclose a stamped, self-addressed envelope large enough to include any photos that we must return to you with the reply.*

Neither Rotunda *nor the author nor any other person who may be consulted assumes any legal responsibility for these opinions or their ramifications. No financial appraisals will be offered. If your query is selected to be published in the column, only your initials and city will appear, in order to protect your privacy. Letters will be acknowledged as staff time comes available.*

several wires rising above it that are bent into circles at the top, would hold stems in place. The glass tumbler prevented water from tarnishing and corroding the metal as well as contact between the flowers and the metal. "Bride's basket" is also a term sometimes used by collectors to describe the novelty art-glass baskets for flowers and the low, coloured-glass baskets in silver-plated stands (for fruit and sweets) that were wedding gifts in the period from about 1880 to 1905.

Your brass vessel is likely to have been made in India sometime in the 1800s. I checked with Beth Knox, the ROM staff member responsible for South Asian material. Beth tells me that the shape of the body is reminiscent of the Lota, the Hindu water pot used to hold sacred water from the Ganges and other sources. Lotas usually do not have a screw-on cover or contain a tumbler. People in India learn to drink by pouring liquid into the mouth rather than touching their lips to the vessels. I have seen at least one other vessel of similar form and suspect that your vessel is a European-inspired version of the Lota meant to be used as a type of canteen. India has had a long history of producing very fine brass, which is often carefully finished by hand. This piece may have come to your family via Ireland or perhaps through some member who travelled in India or served in the colonial civil service there. Thank you for sharing your family heirlooms with our readers.

PETER KAELLGREN,
DEPARTMENT OF WESTERN ART AND CULTURE, ROYAL ONTARIO MUSEUM

Dear ROM Answers,

I have been informed that my tapestry, shown in the photograph, should more properly be called a "throw" because it was likely draped over the back of a sofa or chair. It has aroused much curiosity, and I would be grateful for any information that you can provide.

It measures 1.22 x 1.83 metres (about 4 x 7 feet). I am not sure

what it is made of. Some say it is woven silk and linen; others say silk and cotton; and one "authority" claims that it is all cotton. The front of the textile is lustrous and soft, while the back, which looks like linen or cotton, has a somewhat rough texture. It is predominantly a lovely rose colour. I enclose an advertising clipping from a recent magazine that shows a tapestry that is amazingly similar. I wonder whether there is a connection. Is it possible that I have a French Aubusson tapestry? The previous owner is deceased and is said to have owned this textile for 90 years.

C. T., QUEBEC

Dear Reader,

Machine-made tapestries are still being produced in quantity. Apparently Belgium is a major source of these decorator textiles; however, I am sure there are other places where they are being manufactured. These tapestries capitalize on the mystique of ones made from the Middle Ages up to the 1700s, which were large and hung in sets from floor to ceiling in important rooms of palaces, chateaux, and even wealthy churches and cathedrals. Aubusson, Beauvais, and Gobelins were three French locations where notable tapestries and tapestry upholstery material were produced in the 1600s and 1700s. These names are broadly used to describe tapestries that relate only to scarce originals best identified by experts.

The recent reproduction tapestries tend to be small. They often show people in fancy historical costumes because this suggests that they are old. Eighteenth-century scenes that look like the paintings of the French artists Watteau, Fragonard, and Boucher are especially popular.

Without seeing your throw firsthand, I can't identify its fabric. Something strong like cotton or linen was likely used for the warp. The weft could be any material, sometimes even synthetics that are lustrous and soft. Synthetics are used because they are less expensive. The subject matter of a Venetian festival complete with gondolas suggests that your throw could date from the early 1900s when themes of Venice, masquerades, and Mardi Gras were often used for popular consumer decorative arts. The soft rose colour and the idea of a throw that could be used on furniture seats or draped over a piano is also typical for the period.

Nowadays, tapestry panels of this type are more likely to be flat woven, which is the case for the one in the advertisement. They are also more likely to be used as hangings and for upholstering chairs or covering cushions. Silky pile is not as commonly found. Machine-made tapestries, such as the one you own, turn up from time to time, particularly in Europe. They have some value as decorator items; however, there does not seem to be a collectors' market for them, and I have never seen any books about them. Thank you for writing to ROM Answers.

P. K.

Imperial China, Medieval Cooking, Costume Jewelry, Diamonds, Potosi, and Gardens

MOST OF US, I SUPPOSE, WOULDN'T quite be aware just how extensive the contemporary documents about life in Imperial China really are. We think of that time and place as one with an enormous peasantry surrounding a comparatively small core of Confucian bureaucrats. But China then was like China now, in that the population was so large, relative to that of other countries, that all facts and figures connected with it are correspondingly—sometimes almost incomprehensibly—huge.

Thanks to all those government clerks, this is true even of printed resources, even though much of what was published was reproduced by cumbersome wood-blocks. The Beijing *Gazette,* for example, didn't switch to movable type until 1638, very late indeed by European standards. But then this is a false comparison, because throughout much of the imperial period, China was deliberately and disdainfully unaware of what took place beyond its borders. A great strength of Timothy Brook's **The Confusions of Pleasure: Commerce and Culture in Ming China** (University of California Press, US$40) is the author's skill in selecting from the great quantity of material available to him.

One of the abiding characteristics of the Ming (1368–1644) was its rising economy. Brook finds this complaint by one tart- tongued rural observer: "I have heard that 10 years ago goose was never served to a guest, but these days it sometimes happens, and as many as several tens of dishes may accompany the rice. Rare styles of clothing and hats are gradually being worn. And there are even those who become merchants!" This quotation comes close to the heart of Brook's wonderful book. Merchants were once at the low end of the rigidly enforced social scale. Then suddenly (or so it must have seemed) the middlemen were the kings of the Middle Kingdom, so much so that in 1378 an imperial edict forbade them from wearing silk. That was about six years after the same emperor, Hongwu, decreed that every person in the realm should wear a particular type of turban. There's no record that anyone complied. This too is significant. Along with wholesale changes in the production and procurement of goods came shifts in how authority was measured out and perceived. People "saw the old models coming apart in the flux of change [and] found the experience of being Chinese less predictable and less uniform."

One of the struggles at the centre of Chinese civilization is that between Confucian authoritarianism and Taoist anti-authoritarianism. China was managed by the Confucian tradition rooted in civil-service examinations, which put the well-educated in command of the state bureaucracy. Or as Brook writes: "The door from economic to social status was the examination system. When a man walked through that door, he converted wealth into public prestige and brought not just himself but his entire family into gentility." The Confucian micromanagement that resulted coexisted uneasily with the Taoist ideal—"a little elite of virtuous elders supervising self-sufficient villages and forwarding modest taxes to a minimalist state." The latter, for example, is what Hongwu (ruled 1368–98) actually claimed to be resurrecting. In fact, his reforms and policies were "one part Arcadian and two parts draconian." Change and growth were getting out of hand and making a mockery of his vision.

China's population during the Ming doubled to about 75 million "mouths." This meant more centralized authority, not less. As Canadians (like Brook, an expatriate Torontonian) seem to understand instinctively, it is difficult to live a good, humane, and honest life in a too-populous and too-powerful country except by either giving in to the ruling forces or keeping one's head down—by becoming either a magnate or a monk. Better to exist in a relatively harmless medium-sized place.

One of Brook's discoveries in researching this "cultural history of a place that commerce was remaking" was a 1609 gazetteer for Sheh county in the hilly region just south of Nanjing. Its author, one Zhang Tao, painted a word-picture of discontent, decay, and woe. "One man in a hundred is rich, while nine out of ten are impoverished," Zhang wrote. "The poor cannot stand up to the rich who, though few in number, are able to control the majority." Zhang, according to Brook, "read the history of the Ming as an inexorable fall.... The dynasty had descended from the fixed moral order [of the Hongwu era] toward a thoroughly commercial and, in his eyes, morally divided society. Commerce—personified in the evil figure of the lord of silver—is figured as the culprit that reduces a

once settled China to a world of anarchic motion where commerce set people travelling, imaginations soaring, and taboos tumbling. By allowing consumption to drive production, commerce disrupted the moral solidarity that Zhang believed was obtained in pure agrarian social relations and fuelled a competition that dissolved communal forms."

Other tensions were straining the society as well, such as the historic divisions between the areas south of the Yangzi River and those to the north. The only common ground, one observer remarked, was that "everyone does business: even some successful officials and men from powerful families carry balances in their own sleeves and will analyse a profit of pennies." The Xuande emperor told his courtiers in 1428, "Growth occurs basically when the people have a chance to engage in their livelihoods, whereas decline is due to palace construction and military adventures." Yet the Mongols, who would topple the Ming and established the last dynasty, the Manchu or Ching (1644–1912), were pushing at the northern gates, almost literally, and had to be held back. At certain periods, coinage was recalled from circulation and used to make arms; at others, the process was reversed.

Similarly, foreign trade and even domestic travel were punished at some times, encouraged at others. This was the era of the Grand Canal (actually a complex network of inland waterways) for moving commodities. It was also the time of a system of special roads for couriers. Huge stores of staples, such as grain and salt, were collected as taxes, warehoused in central locations and released to ease the recurring famines or simply to bring down soaring prices. Travellers did well to cover 45 kilometres in a day. Peasants did well to still own their land. By 1500 or so, many were working to fill the granaries of landlords who dealt in grain commercially.

Someone complained that women from even the remotest corners of the realm now "in their personal adornment are almost indistinguishable from those in town," while in cities a new kind of culture sprang up. Since "a wide knowledge of antiques is the first requisite of a gentleman," the nouveaux riches "had to be instructed about the right things to own and how to own them." Counterfeiting items of good taste became big business.

Old customs withered. "The funeral, the key moment for recertifying relations between the still living, was no longer reinforcing kinship solidarity but providing instead an opportunity to buy status and set the wealthy apart from their poor kin." Brook cites a complaint that the price of hiring a first-class writer to compose a eulogy for a dead relative had risen from one-tenth of an ounce of silver to a full ounce in only a short time. Again, Brook is so expert at finding these revelatory statements that his work calls to mind the pioneer social historians such as G. M. Trevelyan. One of his brightest moments is calculating that, in the 17th century, when China began allowing trade from Europe on a significant scale, six ships arrived in 1637 with 38,421 pairs of eyeglasses among their cargo. Brook then tries to imagine the effect this would have had on how closely texts were read and, therefore, on how subtly doctrines were either followed or ignored.

Some other new books of interest to *Rotunda* readers:

• One of the best-loved books originated by the University of Toronto Press is **Pleyn Delit: Medieval Cooking by Modern Cooking** ($17.95 paper) by Constance B. Hieatt, Brenda Hosington, and Sharon Butler. It provides modern recipes of various medieval dishes; it's led many people (not all of them medievalists) to begin experimenting with the cuisine, which since then has undergone something of a revival. **The Medieval Kitchen: Recipes from France and Italy** by three European scholars, Odile Redon, Francoise Sabban, and Silvano Servetti (University of Chicago Press, US$32.50), throws new light on the subject, at least for general readers. We might assume that the poor had a poor diet and the rich a rich one. In fact, sound nutrition and attractive taste were spread more evenly throughout the two societies studied. The book contains a wealth of historical, literary, and anecdotal information as well as over 200 recipes. If you want to use *The Medieval Kitchen*, be prepared to eat more game than urban Canadians are accustomed to doing.

• Costume jewelry needn't be cheap, tacky, or imitative of the more expensive kind. That's one of the messages of **A Collector's Guide to Costume Jewelry: Key Styles and How to Recognize Them** by Tracy Tolkien and Henrietta Wilkson (Firefly, $19.95 paper). Another is that mass-produced jewelry seems to have followed the same trends found in the visual arts. A mock-medieval arts-and-crafts period gave way to an art nouveau period, which gave way in turn to a deco one, and so on. Indeed, the book runs up to the present but its heart clearly belongs to the 1920s and 1930s. The text is knowledgeable and readable and the illustrations often excellent. The authors, quite rightly, pay attention to the distinctive styles of the various jewelry design houses.

• **The Nature of Diamonds** edited by George E. Harlow (Cambridge University Press, US$29.95 paper) is a different type of work entirely: a gathering of experts in every, well, facet of the subject, including the chemical, the historical, the artistic—and the financial. The editor is well informed on the rise of diamond exploration in Canada during recent years, noting how one mine, in the Northwest Territories, will suddenly push Canada from nowhere to number six on the list of diamond-producing countries, by weight. But such is South Africa's diamond industry that this figure still means that Canada can expect to command only about three per cent of the international market. *The Nature of Diamonds* is full of such information and is gorgeously illustrated as well.

• The smallish provincial capital of Potosi in the southwestern mountains of modern Bolivia is remembered now as once having been perhaps the richest city in the New World and one of the Europeans' first. In 1535, the Spanish began exploiting what soon became the world's largest silver mine. Much of the treasure shipped back to Spain so hazardously by the famous galleon fleets had its origin in Potosi and the surrounding area, which is rugged and mountainous. Silver is still mined there today, along with tin, but the glory days of Potosi were relatively brief. While they lasted, however, they resulted in an incredibly heavy concentration of the sort of artworks depicted so beautifully in **Potosi: Colonial Treasures and the Bolivian City of Silver** by Pedro Querejazu and Elizabeth Ferrer, a bilingual (Spanish/English) publication of the University of Arizona Press (US$29.95 paper).

• In the past few years, gardening, or rather garden design and history, has come more and more to be seen as a branch of aesthetics, not just as some subcategory of landscape architecture. Each year, new books attest to this change, which no doubt has environmental and millennial overtones. The latest is *What Gardens Mean* (University of Chicago Press, US$40) by Stepahanie Ross, who pillages all the humanities for insight into how people's perceptions of gardens, particularly the formal gardens of the 18th century and later, have changed: a matter less of horticulture than of cognition, it would seem.

• Robert and Olivia Temple have reclaimed for adults the classic fables associated with Aesop, a Phrygian slave who lived in the 6th century BC. In *Aesop: The Complete Fables* (Penguin Books Canada, $11.95), the Temples translate 358 of the short moralistic tales, including 100 that are appearing in English for the first time.

DOUGLAS FETHERLING
Douglas Fetherling is book reviews editor of Rotunda *magazine*

Here's Looking at You?

THIS FRIGHTENING FACE IS, IN FACT, THE BLOATED rump of a previously unknown species of frog. Found in Vietnam, the frog (top) inflates its rump when intimidated by a predator. If this action is not an effective deterrent, then the frog secretes a gluey slime from its skin, which can potentially seal the jaws of the attacker.

PHOTOGRAPHY BY ROBERT MURPHY

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